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RIVER SYSTEMS PLANNING STUDY FOR SELECTED RIVERS IN NEW BRUNSWICK

VOLUME I

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Dear Mrs. Yerxa:

We are pleased to submit the final report "River Systems Planning Study for Selected Rivers in New Brunswick - Volume I. This report is a synthesis of the former Phases I - III reports. This volume establishes the basis for determining the relative heritage value and management feasibility for the study rivers. It also provides a basis for determining potential candidate rivers for nomination to the Canadian Heritage Rivers System or rivers meriting consideration as provincial heritage resources.

We trust that you will find this report meets your requirements and we would be pleased to discuss it with you at your convenience.

Yours truly,

Robert Hutt

Robert Hutt, P.Eng.
Vice-President

DH/amm

Enclosure

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1.0 INTRODUCTION

1.1 Background

New Brunswick is endowed with a large number of rivers, many of which have clear and clean water and flow naturally through very beautiful countryside. The Province has long been recognized for the quality of its rivers. Rivers such as the Restigouche, Miramichi and the Saint John are internationally renowned for exceptional Atlantic salmon angling.

New Brunswick was one of the first provinces to be settled in Canada and its rivers have been used extensively during the process of development and urbanization. They have been used as a source of water supply, for transportation and for disposal of domestic, municipal and industrial wastes. Their courses and regimes have been altered for navigation and hydroelectric development, and the natural resources in and around them have been harvested. As a result, some of New Brunswick's rivers have been subjected to stresses of many types.

Recently, increases in multiple-use conflicts (i.e., fishing versus canoeing, industry versus recreation) have become more frequent, with various groups calling for conservation and management. This is partly due to increased participation in recreational activities, allowing more personal contact with the natural environment. This has given rise to an increase in public awareness and interest in the environmental condition and the impact of man's encroachment upon the environment.

The results of a U.S. Travel Market Study published by Tourism Canada in 1986 indicated that outdoor recreation was one of the Province's main attractions. As wilderness areas in the United States and other provinces experience increased utilization, it is anticipated that outdoor enthusiasts will look to New Brunswick in greater numbers.

In response to the importance of the Province's river systems and the potential for increased stress, the New Brunswick Department of Tourism, Recreation and Heritage, in cooperation with the Canadian Parks Service, Department of the Environment, initiated a river systems planning study for twenty-four preselected rivers or river sections in New Brunswick. The study evaluated these rivers as potential candidates for nomination to the Canadian Heritage Rivers System (CHRS) and those which may possess qualities suitable to be deemed provincially significant heritage resources.

The CHRS was established in 1984 with two principal objectives. The objectives of the CHRS are to give national recognition to important Canadian rivers and to ensure their future management such that:

- the natural heritage which they represent is conserved and interpreted.
- the human heritage which they represent is conserved and interpreted.
- the opportunities they possess for recreation and heritage appreciation are realized by residents of and visitors to Canada.

As a means of achieving these objectives, three sets of heritage value guidelines have been established for the selection of Canadian Heritage Rivers. The selection guidelines for natural heritage value, human heritage value, and recreational value provide requirements which must be met in order for a nominated river to be included in the CHRS. A nominated river may be accepted by the Canadian Heritage Rivers Board if it meets one or more of the selection guidelines and a set of integrity guidelines (Parks Canada, 1984; redrafted guidelines adopted June 14, 1989, see Appendix A). Collectively, these guidelines provide an excellent vehicle to examine rivers for their natural and historical significance, their recreational potential, and to identify management and development alternatives.

The river systems planning study is comprised of four phases:

Phase I	Development of a River Classification and Rating System for Heritage and Recreational Values;
Phase II	Heritage and Recreational Values Assessment;
Phase III	Management Feasibility and Implications; and
Phase IV	Summary, Conclusions and Recommendations.

Volume I contains a synthesis of Phases I - III and serves as the study background document in which the basis is established for the summary, conclusions and recommendations presented in Phase IV which is contained in Volume II.

1.2 Study Objectives

The primary objective of this study was to develop and implement a systematic method for selecting rivers in New Brunswick which merit special consideration for nomination to the CHRS, and merit possible further consideration as significant provincial heritage resources. Through the application of this method the natural heritage values, human heritage values, recreational values and the integrity associated with each of these were evaluated and documented for each of the study rivers.

The second objective was to assess the management feasibility of each river by determining and evaluating various issues which affect the potential for rivers to be managed, consistent with the CHRS objectives and Provincial policies.

The consequential ranking of the rivers has been prepared to provide a management tool to assist the Province in outlining priorities with respect to the management of rivers and determining which rivers warrant further study for possible nomination into the CHRS.

1.3 Study Process

In Phase I, the systematic approaches employed in other CHRS studies (Baker, 1984; Juurand, 1986; Rutherford, 1986; Halfyard, 1987) were reviewed and used as guides in defining certain themes and ratings for New Brunswick rivers. This, combined with information gathered from a review of additional literature formed the basis for developing a checklist of factors to be considered in assessing heritage, recreational, and integrity values of the twenty-four study rivers. The evaluation criteria were developed specifically for New Brunswick rivers, but reflect the CHRS selection guidelines.

In Phase II, information on all significant natural heritage, human heritage, and recreational values relevant to the twenty-four study rivers was compiled and evaluated. Data were collected from a wide range of sources. These included published and unpublished reports of various types, topographical, geological, land capability, and various other land use and resource maps, files from various government departments and research institutions, personal interviews with individuals from various government departments, universities, and specialists from the New Brunswick Museum, and questionnaires distributed to knowledgeable individuals within various agencies and organizations.

The rating criteria developed in Phase I were applied to evaluate and score the data compiled in Phase II. The rivers were ranked according to the scores achieved for natural heritage, human heritage, recreational, and multiple (combined) values. Following this ranking, the general integrity guidelines were applied to each river to determine if the conditions set out in these could be met, and that the river possessed the specific integrity values for natural heritage, human heritage, and recreation.

In Phase III, a study of management options and implications associated with managing rivers in New Brunswick was conducted. This involved: a literature review of relevant reports and government documents; interviews with individuals who have jurisdictional interest in water and land management as it relates to heritage rivers and individuals from various government agencies and management commissions; a review of applicable federal and provincial regulatory legislation and their adequacy for the protection and management of heritage rivers in New Brunswick. Management considerations were identified and evaluation and rating criteria were developed to assess and rank the management feasibility of each river.

The assessment of management feasibility was based on existing and potential (within approximately 10 years, where information was available) land and water use within the river environment.

A list of individuals who contributed information to the study is presented in Appendix B.

1.4 Study Rivers

Twenty-four rivers or river sections have been evaluated as to their natural heritage, human heritage, recreational, and integrity values, and management feasibility. The locations of the twenty-four rivers are shown in Figure 1 and the boundaries used in the assessment of values for each are described in Appendix C.

The twenty-four study rivers are:

- Cains
- Dungarvon
- Eel
- Kedgwick
- Kennebecasis
- Kouchibouguac
- Little Southwest Miramichi
- Magaguadavic
- Nashwaak
- Nepisiguit
- Northwest Miramichi
- Oromocto
- Patapedia
- Petitcodiac
- Portobello

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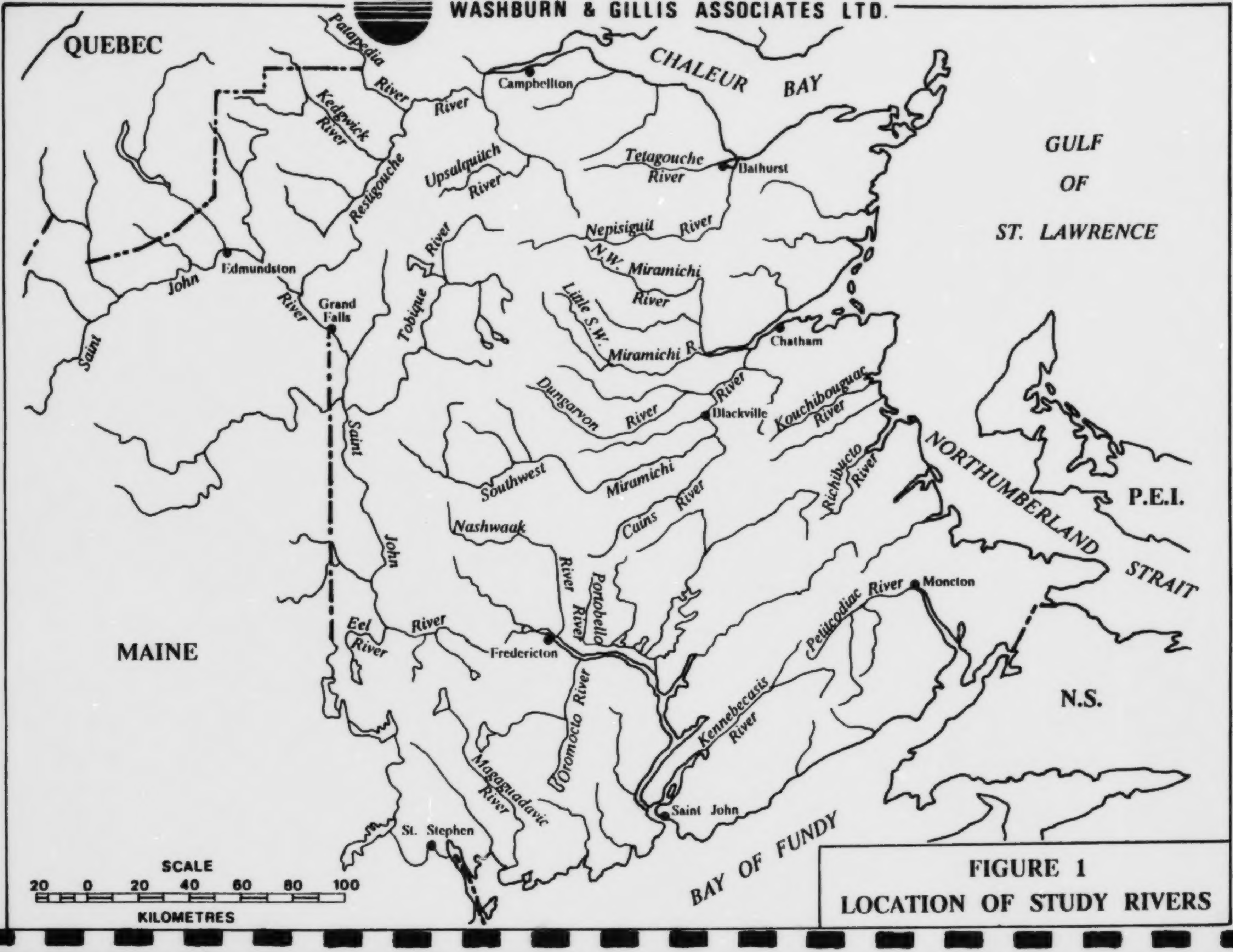

FIGURE 1
LOCATION OF STUDY RIVERS

- Restigouche
- Richibucto
- Saint John - Lower
- Saint John - Middle
- Saint John - Upper
- Southwest Miramichi
- Tetagouche
- Tobique
- Upsalquitch

2.0 RIVER VALUES CLASSIFICATION SYSTEM DEVELOPMENT

This section contains a description of: the thematic framework used in developing the evaluation system for classifying and rating values associated with study rivers; the CHRS selection guidelines for evaluating the natural heritage value, human heritage value, recreational value, and integrity value of potential CHRS candidates; and the value categories chosen for determining the river value as it relates to each of the respective guidelines.

2.1 Thematic Framework For Heritage Values

2.1.1 Explanation of the Thematic Framework Approach

The classification and rating system was developed to reflect the CHRS selection guidelines and to specifically address New Brunswick conditions. The system devised for this study is a modification of systematic approaches employed in other CHRS studies. It consists of the thematic organization of major natural, human, and recreational features and relationships relating to heritage river values, consistent with the selection guidelines.

The thematic approach satisfies the ten basic requirements of a river evaluation system presented by Baker (1984). Halfyard (1987) indicated that prior to the adoption of the thematic approach, there was no method of river classification for applying the CHRS selection guidelines on a national level. The thematic approach facilitates the application of the guidelines to diverse situations.

While other studies have used the approach of a thematic framework, there has been little consistency in its mode of application to the CHRS guidelines. In an attempt to bring the process a step closer to that described by Parks Canada (1984), the heritage value guidelines have been closely followed in developing the evaluation system in this study.

2.1.2 Theme Identification

The CHRS heritage value guidelines provided the basis for theme identification and the development of criteria for evaluation. Each of natural heritage, human heritage, and recreational value are considered as themes. The heritage value guidelines under each of these themes are considered as theme categories. Each of these categories are comprised of various components and sub-components which address the requirements of the particular guideline to which they apply.

A literature review was conducted to identify the range of natural heritage, human heritage and recreational components associated with New Brunswick rivers. Many of these are similar to those identified in previous heritage river studies, but have been adapted for New Brunswick rivers.

2.2 Definition of River Environment

The heritage value guidelines state that outstanding Canadian natural heritage value, human heritage value, or recreational value will be recognized when a river environment meets the requirements of the respective guidelines. The operational definition of river environment is modified from Baker (1984).

In this study, the river environment includes the river channel, the valley floor, and the valley walls to the crest. The length of the river environment is considered to be the sum of the distance on both sides of the river.

2.3 Natural Heritage Value Guidelines and Value Categories

The CHRS natural heritage value guidelines state that recognition will be given when a river environment meets one or more of the following:

- it provides an outstanding example of the effects of major stages and processes in the earth's development;

- it provides outstanding representation of significant ongoing fluvial, geomorphological and biological processes;

- it contains along its course unique, rare or outstanding examples of natural phenomena, formations or features, or areas of exceptional natural beauty;

- it contains along its course habitats of rare or endangered species of plants and/or animals, including areas where outstanding concentrations of plants and animals of Canadian interest and significance are found.

For the purpose of assessing New Brunswick rivers for outstanding natural heritage, four value categories have been chosen, reflecting the CHRS guidelines given above:

(i) Geological Development
(ii) Ongoing Processes
(iii) Natural Phenomena/Natural Beauty
(iv) Biota

The natural river environment is a dynamic and complex system of integrated biotic and abiotic factors. This is recognized in the various components that comprise these categories.

2.3.1 Geological Development

The major features of New Brunswick landscape including topography and physiography have resulted from a long period of geological development. Other characteristics such as the smoothing of surface features and deposition of surficial materials have resulted from more recent glacial activity.

Several components were evaluated to determine which rivers best represent the major periods of geological time in which the surface of the earth underwent major changes and stream modification. The evaluation of geological development focused on both physiography and geology, as they relate to the study rivers.

2.3.1.1 Physiography

New Brunswick falls into four principal physiographic divisions: the Notre Dame Mountains, the Chaleur Uplands, the New Brunswick Highlands, and the Maritime Plain (Bostock, 1970; Clayton et al., 1977).

The Notre Dame Mountains cover a small area in the extreme northwestern region of the Province, adjacent to the Chaleur Uplands, exhibiting a northeast - southwest trend. The elevations in New Brunswick range between 150 and 620 metres. Numerous lakes characterize the rugged surface topography.

The Chaleur Uplands lie immediately southeast of the Notre Dame Mountains, comprising low, dissected and ice-smoothed peneplains. The uplands range between 245 and 305 metres in elevation, consisting of uniform summits broken by isolated ridges, which slope southeast to merge with the central highlands. The plateau is deeply trenched by the Saint John River and Restigouche River systems. Numerous swampy plains and lakes are found in this heavily forested upland area.

The New Brunswick Highlands (central highlands) are heavily dissected by rivers. Three separate regions are recognized, as divided by the Saint John River: the Miramichi Highlands to the northeast, St. Croix Highlands to the west, and the Caledonia Highlands to the east of the river. In the northeastern and western sections of the highlands large granitic intrusives give rise to a more rugged relief exceeding elevations of

800 metres in the northern sections and reaching elevations of 300 metres along the Bay of Fundy. Erosion and weathering of rock strata of variable resistance, many outcrops, and numerous river valleys cut deeply into the landscape, contribute to the ruggedness of the central highlands.

The Maritime Plain extends eastward from the central highlands, stretching along the entire east coast of New Brunswick from the south shore of Chaleur Bay. This is a large roughly triangular depositional basin with an elevation generally less than 100 metres, sloping gently toward the coast. Broad flood plains and low river gradients put some lowland areas at high risk of flooding.

River environments have been evaluated with respect to the number of different physiographic regions through which they flow.

2.3.1.2 Geology

The evaluation of representation of geologic time in river environments is based upon the bedrock geology, palaeontology, and surficial geology of each study river. In terms of geologic time, periods (i.e., the Cambrian) may last for tens of millions of years, while eras (i.e., the Palaeozoic) last for hundreds of millions of years (see geologic time scale in Appendix D). Periods and eras represent important changes in the world's biology, with eras marking relatively greater crises for organisms than periods.

Bedrock Geology

The bedrock geology is reflected in the relief of most of the province. Palaeozoic slate and argillite bedrock in northwestern New Brunswick form a strongly dissected plateau, rising above 600 metres in the vicinity of granitic intrusives. The approaches to upland areas are often formed by Precambrian quartzites. Recent horizontally stratified sandstones, shales, and conglomerates are found in the lowlands.

Older Palaeozoic rocks in central and northwestern New Brunswick are of Ordovician, Silurian, and lower Devonian age. These beds have been metamorphosed, resulting in strong vertical cleavage. Combined with the soft nature of the rocks, this has allowed the formation of deeply cut, V-shaped valleys.

The more recent horizontally bedded sandstones and shales are of Mississippian and Pennsylvanian age. These are associated with conglomerates, coal deposits, and limestones. Stream action has not greatly dissected the majority of these beds.

The evaluation system has focused on the geologic age of bedrock in the river environment. Study rivers have been assessed as to the number of eras and periods occurring along their course. River environments having more eras, periods, and geologic features represented, received higher ratings than those with fewer representations.

Palaeontology

Fossils are traces of organisms which are usually preserved in rocks. These can range from a complete animal or plant to a trace such as a footprint.

Fossils, in most cases, are found in sedimentary rock from a wide range of geologic periods and have been found along many rivers in New Brunswick. Some fossils are common while others may be considered unique or rare.

Precambrian rocks are the earliest known to contain fossils in New Brunswick. Rare stromatolite fossils have been found in beds along the Saint John River, and are the oldest known in the Province. Trilobite fossils have been known to be present in Cambrian rocks in the Province for more than a century. Ordovician rocks have a few graptolites and brachiopods occur in widely separated localities in New Brunswick. Fossils are locally abundant in Silurian rocks. Calcareous sediments are characterized by brachiopods, corrals and trilobites, while graptolites are most common within greywacke sequences in central New Brunswick. Pennsylvanian rocks contain locally abundant plant remains.

The palaeontology of river environments compliments the geology in the evaluation process. Rivers have been evaluated, based on available information, on the presence and abundance of fossils and their uniqueness or rarity.

Surficial Geology

Glaciation has had a marked effect on the development of landscape features and rivers in New Brunswick. During the Pleistocene epoch, the Appalachian Region was covered by ice, resulting in much of the pre-glacial surface being scoured and subsequently covered with a layer of very heterogeneous glacial drift of varying thickness (Clayton et al., 1977).

Glacial drift is distinguished based upon sorting characteristics (stratified vs unstratified) and the relationship of the deposit to the ice which formed it. Depositional features associated with active ice are most common in mountainous areas and include drumlins and various types of moraine. Deposits laid down in connection with decaying ice include eskers, kames, and glaciofluvial deposits.

Glacial deposition has two-fold importance to stream flow. Firstly, pre-glacial river courses may have been entirely filled with glacial deposits, and secondly, some deposits may have diverted the stream to new courses. The result is a major alteration of drainage from pre-glacial times to their present positions.

During late glacial and early post-glacial periods, southern and eastern coastal areas were affected by marine submergence, the most extensive areas of marine submergence occurring along eastern New Brunswick (Clayton, et al., 1977). Raised glacial marine deltas, forming where major melt water streams once discharged into the ocean, are found along the south coast between St. George and Saint John (Environment Canada, 1989).

Ice-contact deposits occur in some highland valleys, while outwash plains, deltas, and fans are found in some lower valleys. Within the Maritime Plain, sandy tills are exclusive to the Miramichi watershed and the lowland plain has wide areas with a thin layer of marine sands. Numerous streams, swamps and bogs occupy the area which was modified by marine and stream action during the late glacial and early post-glacial periods.

Two major aspects of surficial geology were considered in the evaluation. Development of the landscape was evaluated through consideration of the stages of surficial development and associated deposit types represented in the river environment. The physical features resulting from the development process which are represented in the river environment were also considered.

Therefore, the evaluation system has focused on the diversity of glacial deposits (kames, eskers, drumlins, moraine, etc.), glacial and post-glacial history (Holocene, Wisconsinan, etc.) and post-glacial deposits (organic sediments, alluvial sediments, etc.) and other types of surficial features (fluted bedrock, striae, sink holes, etc.) in the river environment.

2.3.2 Ongoing Processes

As distinct from the periods of the earth's development, components for evaluation within this category focus upon ongoing processes relevant to the evolution and form of the river and its associated plant and animal communities. Rivers are the result of very complex interactions of many inter-related processes. Processes involve changes in position or state of objects or properties over a period of time. Rivers and their waters are considered to be important resource units due to the environment they provide for vegetation, aquatic animals and river-dependent terrestrial animals. Rivers and flow regimes depend upon, and integrate, land and climatic events in the watershed. They are active agents in landscape change and indirectly control other processes, destroying and creating a variety of habitats in the course of erosion and sedimentation (Welch, 1978).

2.3.2.1 Physical Processes

The main physical processes by which the rivers and river systems develop are erosion, transportation and deposition of material (Leopold et al., 1964). These processes in conjunction with surface runoff and river flow represent important links between geological and hydrological cycles. The relative importance of the different processes and the type and rate of river development may be highly variable.

Erosional and depositional processes in one part of a river are intimately connected with the geomorphological processes in another, with geomorphological evolution being markedly affected by changes in sedimentation. River features assessed in the evaluation system reflect, and are illustrative of, these processes and fall under the broad headings of hydrology, water quality, and morphology.

Hydrology

Under hydrology, a number of distinguishing river characteristics are considered. The characteristics of a river channel will change whenever a change occurs in any of the conditions that govern fluvial morphology. Aspects of hydrology, particularly flow pattern, was the focus of the evaluation of hydrologic features.

The assessment of flow pattern considers mean annual discharge, drainage area, discharge variability, and system storage and flow type (regulated vs natural). The occurrence of unique hydrologic features (i.e. tidal bore) are also considered in the evaluation.

The evaluation system has focused on outstanding representation of flow pattern characteristics, and unusual or significant hydrologic characteristics associated with rivers of various size in the context of the regions in which they occur.

Water Quality

Water quality has been monitored for many years in the major surface waters of New Brunswick. Many parameters are measured to determine the quality of chemical and physical parameters of the surface waters and assess their ability to support aquatic life. The quality of surface waters in New Brunswick is generally excellent with predominately calcium bicarbonate-type waters (Environment Canada, 1989).

Rivers of various basins in the Province may differ based on properties of the bedrock type. This is reflected in total dissolved solids, alkalinity (as $CaCO_3$), calcium, colour, turbidity, sulphate, chlorides, sodium and magnesium.

During a review of the historic water quality in the Province, several parameters were identified in various river basins as being in noncompliance with guidelines established for protection of freshwater aquatic life (Environment Canada, 1989). These include cadmium, chromium, copper, iron, lead, nickel, dissolved oxygen, pH, phosphate, suspended solids and zinc.

The evaluation system has focused on representation of natural water quality characteristics associated with the region in which the river occurs, the diversity of natural water quality conditions along the river, and compliance of parameters with water quality guidelines for protection of freshwater aquatic life.

Morphology

Under morphology, the various processes acting to form a river are considered in terms of the resultant patterns of development. Landforms associated with a particular river provide an account of the river's past and present activity. The evaluation system has focused upon the outstanding representation of particular morphological features and diversity of these occurring in the river environment. These morphological features include channel controls (falls, rapids, etc.), channel patterns (straight, meandering, braided), lateral channel activity, channel features (islands, bars, etc.) and associated valley features (flood plains, deltas, oxbow lakes, etc.).

2.3.2.2 Biological Processes

Biological processes within the river environment are responsive to the physical processes and, in many instances, have a modifying influence. For example, the distribution of flora and fauna is largely dependent upon velocity. During summer months large quantities of rooted vegetation may develop in shallow slow water. These alter the substrate by accumulating silt and may impede the flow, influencing the effects of low summer discharge (Hynes, 1970).

The evaluation of biological processes considered the floral and faunal communities represented in the river environment. The floral aspect of the evaluation system includes geographically distinct vegetation regions through which the river flows, associated wetlands, and natural state. The faunal aspect included only wildlife (fish, mammals, birds) which exhibit river dependence for part of their life cycle or are strongly associated with the river environment.

Vegetation

The vegetation in New Brunswick falls within the Southeastern Mixed Forest Region of Canada (Clayton et. al., 1977) which is divided into two Forest Floral Regions. All of the province south of the Chaleur Uplands is included in the Acadian Forest Floral Region. The remainder of northern New Brunswick lies within the Great Lakes - St. Lawrence Forest Floral Region (Scoggan, 1978).

New Brunswick has been classified with respect to ecoregions and forest zones (Loucks, 1962). An ecoregion is a region recognized by vegetation in relation to selected environmental criteria and is the geographic unit within which ecological relationships between species and sites are similar. For broad comparison of the predominating tree species, the forest zone groups ecoregions, showing affinities of dominant species composition.

In New Brunswick, six forest zones comprised of eight ecoregions have been identified. These are the sugar maple-ash zone (Saint John River ecoregion), sugar maple-hemlock-pine zone (Restigouche and Magaguadavic ecoregions), sugar maple-yellow birch-fir zone (Maritime Uplands ecoregion), red spruce-hemlock-pine zone (Maritime Lowlands ecoregion), spruce-fir coast zone (Fundy Bay ecoregion), fir-pine-birch zone (New Brunswick Highlands and Gaspe ecoregions).

The forest parameters evaluated include the variety of ecoregions of the Province represented in the river environment and the quality of the vegetation cover (natural state) in the river environment.

Vegetated wetlands provide important environments in which a variety of natural biological processes occur. Wetlands occupy the transition zone between the aquatic and terrestrial ecosystems of the river environment and provide habitats for diverse species. New Brunswick wetlands have been found to include bogs, fens, marshes, swamps, shallow open water and tidal mud flats. These have been estimated to comprise some 5% of the total area of the Province (Montreal Engineering Company Limited, 1979).

Wetlands evaluation has been based on the extent of wetlands represented in the river environment.

Wildlife

For the purpose of this study, wildlife has been considered to be non-domesticated vertebrate animals including fish, mammals, and birds.

Obviously, fish are completely water-dependent for their entire life cycle. New Brunswick has 42 species of native freshwater fish, plus four introduced species (Clayden et al., 1984). These are comprised of resident, anadromous (living mainly in salt water and spawning in freshwater), and catadromous (living mainly in freshwater and spawning in salt water) species. Many species of fish exhibit various characteristics which reflect the type of habitat to which they are best suited and certain species are characteristically representative of particular habitat types.

The evaluation system related to fish has focused on the diversity of species present and the habitat types represented by the assemblage of species. The presence of critical habitat areas has also been considered in the evaluation system.

Approximately 55 species of land/freshwater mammals have been recorded in New Brunswick (Clayden et al., 1984). Mammals are well represented in the river environments in the Province. Many mammals utilize riparian zones and the life cycles of some are dependent on the freshwater environment.

Certain mammals obtain a significant portion of their diet as aquatic biota. Several carnivores regularly feed in streams. Raccoons eat crayfish and small aquatic vertebrates and otters and mink eat fish, crustaceans, and molluscs. Larger mammals such as the moose are strongly associated with some river environments, as their diets are largely comprised of aquatic vegetation. Members of several other families of mammals, including white-tailed deer, black bear, and red fox, often inhabit well-wooded river environments or move to them on a seasonal basis to seek protection, food, or denning.

The rodents appear to be the most important group of river mammals as there is a wide range of species which are associated with water. Well known among these are some species of shrews that feed mainly in the water, consuming various quantities of aquatic insects. Others such as the beaver and muskrat are vegetarian, but may do much of their feeding away from the water. The building activity of some rodents can have major effects on rivers and streams. The burrowing activities of some, like the muskrat, may undermine the banks and alter channel patterns. The beaver can entirely change the nature of streams by the building of dams. These animals have an enormous influence on river hydraulics, changing typical running water habitats to standing water. These impoundments change the substrate to silt, encourage changes in benthic fauna from typical running water species, encourage the growth of rooted vegetation and provide pools for fish and additional waterfowl habitat.

The evaluation system as related to mammals has focused on the diversity of river-dependent species and species strongly associated with the river environment and the habitat types represented by the species present. The presence of critical habitat areas have also been considered in the evaluation system.

There have been approximately 350 species of birds recorded in New Brunswick (Squires, 1976). There are several groups of birds which are closely associated with rivers and streams. Of these, the cormorants, herons, mergansers, ospreys, bald eagles, loons, and kingfishers feed primarily on fish, but mergansers and kingfishers also eat invertebrates. Others may feed primarily on invertebrates, although they often consume fish and vegetable matter. Clearly, birds play a significant role in the ecology of rivers.

The evaluation system related to birds has, therefore, focused on the diversity of river-dependent species and species strongly associated with the river environment and the habitat types represented by the species present. The presence of critical habitat areas has also been considered in the evaluation system.

2.3.3 Natural Phenomena/Natural Beauty

The third natural heritage value guideline requires that the river environment have unique, rare or outstanding examples of natural phenomena, formations, features, or areas of exceptional natural beauty.

There are inherent problems with evaluating natural phenomena and natural beauty when they are combined in one evaluation system. It is possible for a river to be very beautiful and have no unique or rare phenomena. It is also possible for a river to be endowed with many natural phenomena which do not contribute to its natural beauty. Therefore, the third natural heritage value guideline is considered to be two in one, and natural phenomena and natural beauty are considered independently.

2.3.3.1 Natural Phenomena

Natural phenomena are considered to be any observable unusual occurrence of biophysical features of a river system. This would include elements resulting from interactions of factors such as geological development and ongoing processes, seasonal concentrations of biota, etc., which impart particularly distinguishable aspects to the river environment.

The evaluation has system focused on the outstanding representation, abundance and diversity of natural phenomena in the river environment.

2.3.3.2 Natural Beauty

Natural beauty may be considered as the possession of qualities or the provision of stimuli by biotic or abiotic parameters (objects, sounds, etc.) which are pleasing or gratifying due to their harmony, pattern, expression, or excellence. The natural beauty of a river environment may be manifested in the attractiveness of the biota, varied and distinguished landscapes, unique natural phenomena, vistas, etc. This would include waterfalls, rock formations, seasonal concentrations of highly visible biota (waterfowl), varied vegetation patterns, etc.

The evaluation system has focused on representation of highly distinguishable landforms/landscape, varied vegetation patterns, natural phenomena, and opportunity for viewing features within the river environment. Consideration has also been given to the natural state of the river environment.

2.3.4 Biota

This category addresses the fourth natural heritage value guideline. Under separate component headings, consideration is given to rare/endangered/threatened species and concentrations of species.

2.3.4.1 Rare/Endangered/Threatened Species

Long-term change in distribution and abundance of species is a natural process. Depending upon the influencing factors, a species may proliferate or experience local or absolute extinction. In recent years processes leading to population declines have accelerated such that once-plentiful species, like the woodland caribou, have disappeared from New Brunswick. Other natural populations continue to decline or become locally extinct, often without notice.

For the purpose of this study, rare species are considered to be those restricted to a small area, or those of broader but consistently sparse occurrence in the Province (Clayden et al., 1984). A species is considered threatened if it is likely to become endangered, in the region under consideration, unless the factors affecting its vulnerability become reversed. Any species of flora or fauna which is threatened with extinction due to the destruction of its habitat, disease, over-exploitation, predation, and the use of chemicals is recognized as endangered (Environment Canada, 1987). The distribution and habitat requirements for rare and endangered species in New Brunswick have been described by Clayden et al. (1984).

Populations of particular species may be considered unique in terms of the species being present only within a particular river environment in the Province, or because the presence of the species has scientific importance (zoogeographic interest).

The evaluation system has focused on the presence of species declared under the New Brunswick Endangered Species Act and species otherwise considered rare, threatened or endangered and their relative abundance in the river environment. The evaluation system also focused on the presence of unique species, including species of national significance.

Although officially considered endangered, the osprey is rather widespread and increasing in number in the Province. Osprey breeding habitat can be found on any of the study river systems. Consequently, the osprey is not considered to provide distinction between rivers, and therefore is not included in the rating system.

2.3.4.2 Species Concentrations

Various species may be found in concentrations due to behavioural traits, growth conditions, stage of development, etc. Concentrations of many species of fish, birds, and mammals are common in the river environment on a seasonal basis depending upon the stage of annual migrations. Other concentrations may result in resident populations due to particularly favourable conditions (feeding, shelter, etc.).

The evaluation system considered river-dependent species and those which are strongly associated with the river. The evaluation system has focused on the number of species which are found to be concentrated in the river environment.

2.4 Human Heritage Value Guidelines and Value Categories

The CHRS human heritage value guidelines state that recognition will be given when a river environment meets one or more of the following:

- is of outstanding importance owing to its influence, over a period of time, on the historical development of Canada through a major impact upon the region in which it is located or beyond; this would include its role in such significant historical themes as native people, settlement patterns, and transportation;

- is strongly associated with persons, events, movements, achievements, ideas or beliefs of Canadian significance.

- contains historical or archaeological structures, works or sites which are unique, rare or are of great antiquity.

- contains outstanding examples or concentrations of historical or archaeological structures, works or sites which are representative of major themes in Canadian history.

For the purpose of assessing New Brunswick rivers for outstanding human heritage, four value categories have been chosen. As a departure from previous heritage river studies, they are based on broad subject areas rather than a chronology of cultural groups. This approach is believed to best reflect the CHRS guidelines.

The four value categories considered are:

(i) Historical Development

(ii) Persons/Concepts

(iii) Rare Finds

(iv) Themes in Canadian History

The value categories have been evaluated to emphasize the significance of the river rather than any particular cultural group. The exception to this is prehistoric peoples. This is warranted as the prehistoric occupation (defined as the period prior to recorded European contact) of the Province represents approximately 10,100 of the last 10,500 years in the total human time-line in New Brunswick.

2.4.1. Historical Development

The evaluation of the historical development of the study rivers has focused on a review of a wide range of data relating to Native peoples, settlement patterns, and transportation.

2.4.1.1 Native Peoples

This component relates to archaeological and documentary evidence of river utilization during the following periods: Paleo period, archaic period, ceramic period, contact period, historic period. The evaluation system also takes into account native sites of undetermined antiquity and resource sites. Canoe routes, portages, migration routes, hunting patterns, settlement locations and trade networks were important to the Native way of life. The assessment of Native peoples considers the 10,000 year Native time-line and includes historical religious sites, such as missions, prehistoric and historic mortuary sites, ceremonial sites, and the location of important events.

The evaluation system has focused on whether or not the river environment contains archaeological sites from the various periods, the density and significance of those sites. Also considered were the number, variety and significance of religious, ceremonial, or mortuary sites, settlements, and locations of important events.

The degree to which the river system played a role in prehistoric transportation and trade networks was also evaluated.

2.4.1.2 Settlement Patterns

The second component in Historical Development relates to documentary records for the locations of settlements that were established or grew because of their importance as trading locations, military establishments, or preferred agricultural areas.

Other settlements grew because of their location at the junction of transportation routes or their location on a transportation route. Areas often also developed because of their importance as industrial, commercial, or business centres.

In New Brunswick the entry-exit point or settling area for cultural groups such as the Acadians, Loyalists, Irish, or other groups, played an important part in the Province's history. Other "groups of cultural interest" may not be as large but are significant, such as the Champlain-DeMonts group of 1604, or the Davidson "family" of the Miramichi. Centres of exploration or resource locations were also important.

The evaluation system has focused on the existence, significance, variety, and numbers of trading locations, military establishments, preferred agricultural areas, junction of transportation routes, location along a transportation route and industrial or commercial centres that are associated with the development of a community in the river environment. The evaluation also focused on whether or not the river environment is associated with the entry, exit or settling area for significant numbers of a cultural, or other important group. Numbers and significance of sites of scientific and military interest and resource procurement were also considered.

2.4.1.3 Transportation

Transportation was a vital factor in the development and growth of the Province. In determining which rivers were integral in this aspect of the Province's development, the transportation component considers the role of study rivers in the transport of people or goods between Europe and New Brunswick and the transport of people or goods within New Brunswick. To further reflect the New Brunswick situation, shipbuilding and distinct vessel types, and establishments associated with transport industry are considered. Examples of shipwrecks and artifacts associated with transportation also add to the understanding of transportation within the Province.

The evaluation of transportation has focused on the importance of the river in terms of transportation of people and/or goods between North America and Europe, and within the Province. The association of the river with shipbuilding or a distinct vessel type was also evaluated. The occurrence of shipwrecks, transportation-related artifacts, and settlements that developed due to their location on transportation routes was considered in the evaluation.

2.4.2. Persons/Concepts

In this category the river is considered for either physical remains or for the role certain "concepts" played in the development of the character of the river. In particular, this category considers political movements, ethnic traditions or ideas of Canadian significance, as well as religious and other beliefs. Special events, outstanding individuals or groups, and special places also add to the heritage of an area.

In the evaluation system, the importance of the strength of the associations between the river and the person or concept have been considered. Also considered important, and therefore incorporated into the evaluation system, were the number and variety of associations on a river.

2.4.3. Rare Finds

Rare finds may include physical remains such as structures or artifacts, as well as sites that may or may not have associated visible features. The evaluation of this category has focused on prehistoric and historic sites that are of significance at the Provincial level as a result of their antiquity or uniqueness. The evaluation has also taken into account the number, variety and significance of known artifact collections, archaeological features, artifact scatters and isolated finds.

2.4.4. Themes in Canadian History

In this category, consideration was given to structures, sites and artifacts that emphasize or represent major themes in Canadian history. The evaluation system focused on examples of structures, works and sites that are not necessarily exceptional, but are typical of major Canadian and New Brunswick historical themes.

Examples of themes in Canadian history include structures such as Old Government House in Fredericton, Loyalist House in Saint John, sites associated with shipbuilding, Confederation, the War of 1812, the two World Wars, the depression, government and other sites or structures typical of Canada or New Brunswick history.

Rivers have been evaluated according to the significance, number, and variety of site types found in their environment.

2.5 Recreational Value Guidelines and Value Categories

In order for a river to be deemed of outstanding recreational value the CHRS guidelines state that the river environment must:

- possess an appropriate combination of recreational opportunities and related natural values which together provide a capability for an outstanding recreational experience, and;
- be capable of supporting recreational uses without significant loss of or impact on its natural, historical, or aesthetic values.

For the purpose of assessing New Brunswick rivers with outstanding recreation value two categories reflecting the CHRS guidelines, have been chosen:

(i) Capabilities
(ii) Impacts/Sensitivities

Within each of these categories, several components have been identified which aid in determining the extent to which a river and its environment may be deemed outstanding. Each of the categories and their components are described in further detail in the following sections.

2.5.1 Capabilities

2.5.1.1 Range of Appropriate Activities

The potential of many New Brunswick rivers for a range of river-related recreational activities is excellent. These activities take place both on the river and within the river environment, and can result in year-round river use. Several New Brunswick rivers offer excellent potential for one or two activities, while others have good potential for several different activities. Opportunities exist for canoeing, kayaking, sport fishing, canoe tripping, hunting, swimming, fishing, cross-country skiing, snow-shoeing, snowmobiling, picnicking, auto touring, and many other activities.

The recreational value of a river is dependent on physical factors which provide the potential for recreational use, the passive setting to allow enjoyment of recreational activities, and the quality and diversity of recreational opportunities traditionally enjoyed by humans.

A river environment with outstanding potential for recreational use should provide good opportunities for a range of appropriate activities or excellent opportunities for a few activities. That is, a river has been evaluated highly in this category if it offers excellent potential for two or more activities, or good potential for several activities at various points along the river.

Canoeing/Kayaking

Many New Brunswick rivers offer very good opportunities for canoeing, kayaking, and canoe camping. The range of skill levels required to navigate the rivers (from class I to class V rapids - International River Grading System) offers varied challenge to all canoeists. For example, sections of the Nepisiguit river system offer several small, quiet lakes, occasional portages, picnic and campsites along the route, and rapids sequences from class I to class V.

The evaluation system has focused on the length of trip that is possible, the challenge to a variety of skill levels, the availability and dispersal of campsites, and the presence of portages where necessary.

Sport Fishing

Sport fishing, especially salmon fishing in New Brunswick, attracts anglers from throughout Canada and many other countries. In recent years, the ban on commercial fishing has considerably improved angling opportunities in the Province. In addition to salmon, anglers are attracted by brook trout, smallmouth bass, and pickerel found in New Brunswick rivers.

The evaluation system has focused on the variety of sport fish species found in the river and the adequacy of the fish population to support angling.

Hunting

Rivers have long been popular as a mode of transportation into the remote areas of the Province for hunting larger game. Hunters use several rivers in the north to provide access to the moose, deer and bear in the interior of the Province. In addition, rivers such as the Saint John, St. Croix, and Restigouche annually attract many hunters in search of waterfowl.

The evaluation system has focused on the variety of species (large and small game and waterfowl), the extent to which the river provides access to hunting areas, and the adequacy of the animal populations to support hunting.

Intensive Recreation

Intensive use recreational activities include any which depend on the natural environment, and in which a relatively large number of people may participate at the same time (but not necessarily together). These activities may include (but are not limited to): swimming, canoeing/kayaking, sport fishing, hunting, beach activities, picnicking, hiking, cross-country skiing, sailing, snowmobiling, power boating, camping, snow-shoeing, auto touring, photography, tubing, or nature/scenic appreciation.

The number and variety of rivers in the Province provide many excellent opportunities throughout the year for recreational activities on both land and water. Residents and visitors alike are attracted by the sailing and wind surfing opportunities on the larger rivers, the scenic views as they hike along a riverbank, or the many opportunities for swimming, picnicking, and cross-country skiing. The suitability of the river to support a wide range of recreation related water and land-based activities is of interest.

The evaluation system has focused on the variety of activities possible, and the potential for these activities along the length of the river.

Human Heritage Appreciation

The human heritage of New Brunswick offers residents and visitors an abundance of fascinating learning experiences. Its rivers provide many opportunities for appreciating historical and cultural sites or regions. For example, Kings Landing on the Saint John River, perhaps the best known heritage site in the Province, draws many interested visitors every year.

The evaluation system related to human heritage appreciation has focused on the number of human heritage sites along the river and their potential for visitor appreciation.

2.5.1.2 Natural Values

The natural environment is an integral part of the river recreation experience. The appreciation of the flora, fauna, and surrounding landscape add an important dimension to the recreational experience. In addition, the feeling of solitude or remoteness is a key reason for participating in many outdoor recreation activities. Without these factors, the value of the recreational activity is diminished and can just as easily take place indoors or at a man-made facility.

Natural Attractions

The scenic beauty of the natural environment is a vital aspect of any outdoor recreational experience. Areas of exceptional beauty may be valued for the attractiveness of the flora, fauna, or landscape. Rivers may pass through or provide unique opportunities for viewing rare, endangered, or especially beautiful plants or animals, changing and interesting landscapes, or exceptionally beautiful vistas. Examples of scenic beauty may include: waterfalls, rock formations, rare or beautiful flowers, lookout points, or areas where opportunities for viewing wildlife are particularly good.

The evaluation system related to the natural environment has focused on the variety and/or uniqueness of landforms; opportunities for viewing rare or endangered species; and/or exceptionally striking, beautiful, or unique flora or fauna.

Solitude/Backcountry

The long history of human habitation, population, settlement patterns, and size of the province preclude New Brunswick from having any true wilderness in the classical sense of the term (i.e. large roadless tracts untrammelled by man, where man is a visitor and does not remain, retaining its primeval character, etc.) (Hendee et al., 1978). However, many areas of New Brunswick have had relatively little human impact and still provide a feeling of remoteness or being "close to nature". In addition, many rivers wind through rural and remote areas with few buildings and little or no industry. These areas too, can provide the sense of solitude sought by many recreationists.

The evaluation system also has focused on opportunities for, and the perception of solitude; the absence of man-made structures, roads, etc.; and the absence of litter and/or pollution.

2.5.1.3 Physical Factors

Several physical factors play a role in determining whether a river environment has potential for recreational activities. Spring flooding and rains or summer drought can completely change the nature of a river from year to year, or from season to season. Obstacles such as rocks, trees, or sand bars can make a river impassable, and litter or pollution may make the river and its environs undesirable to potential users. Physical factors including water flow, navigability, access, water quality, and shoreline must be adequate to permit recreational activities and attract visitors during at least part of every year (Franks, 1977).

Physical factors have been evaluated with consideration given to the type and nature of activity(ies) for which the river has the best potential.

Water Flow

Water flow, both throughout the season and from year to year, is a basic requirement for participation in any water-based activity. Rivers which are too narrow or shallow, are dried up completely, or which are flowing too fast, will hinder or preclude recreational use.

The evaluation system has focused on the depth, speed, and width of the river and the dependability of flow both throughout the year, and from year to year.

Navigability

The navigability of a river is limited by the number of obstructions which may hinder passage or prevent boating or other water-based activities altogether. For a favourable rating there should be few, if any obstructions. Potential obstacles might include: rocks, logs, trees, rapids, sand bars, dams, etc.

The evaluation system has focused on the number and nature of obstacles and the extent to which they may limit navigability.

Access

River access is a key factor in assessing the recreational value of a river. Access by road should be possible at appropriate points along the river and the launching spots should be adequate for both large and small crafts.

The evaluation system has, therefore, focused on the appropriate dispersal of access points along the river and the suitability of potential launching areas for large and small crafts.

Water Quality

Although detailed information on the chemical and microbiological characteristics of the water quality may not always be available, several aesthetic qualities of the water may be fairly easily judged and are very important to the recreational river user. In fact, water quality is one of the attributes most often identified as important to river users (O'Leary and Adams, 1982).

The evaluation system has focused on the colour, odour, extent of aquatic vegetation, presence of solid waste, and turbidity. These factors should appear acceptable for both contact and non-contact water-based activities, and poor quality with respect to any one may be considered to be unacceptable (O'Leary and Adams, 1982; Anonymous, 1987).

Shoreline

The shoreline and river environment are the focus of many recreational activities. As such, a river with outstanding potential will have many stretches which are conducive to a variety of activities (swimming, hiking, camping, etc.). Factors such as slope, ground cover, and drainage also play an important role in determining the potential of a river environment for recreational use. The slope of the riverbank should not be so great as to preclude boat launching, swimming, and other recreational activities. Other undesirable factors include: excessively rocky or marshy ground, susceptibility to flooding, poor drainage, presence of nuisance plants such as poison ivy, etc.

The evaluation system has, therefore, focused on the appropriateness of slope, vegetation, drainage, and terrain for a range of recreational activities along the river.

2.5.2 Impacts/Sensitivities

The CHRS guidelines recognize that a river must be capable of supporting recreational uses without significant loss of or impact on its natural, historical, or aesthetic values. The sensitivity to use of any particular area is not fixed, but depends on many factors including the intensity of use (i.e., total number of users, number of users at any given time, etc.), the season(s) of use (i.e., summer months only, year round, etc.), and the type of activity taking place (Hendee et al., 1978).

River environments must be able to withstand a certain amount of human impact, and be able to support large numbers of people both concentrated in small areas, and spread out along the river. This category has been evaluated with consideration given to the type and nature of activity (ies) for which the river has the best potential.

2.5.2.1 Physical/Ecological Impacts

Along with human use of the natural environment comes a certain amount of negative impact. Rivers which are to be designated as heritage rivers under the recreational theme should not contain natural, historical, or aesthetic elements which would be seriously threatened by human use.

Physical or ecological impacts as a result of recreational use include (but are not limited to): vegetation loss, replacement of vegetation by non-native species, soil erosion and compaction, water quality impacts, and impacts on wildlife behaviour and population levels (Hendee et al., 1978). Other impacts include damage to historic sites or impacts on the natural environment which would diminish aesthetic value of the river.

The evaluation system has focused on existing and/or potential impacts to the natural, historic, and/or aesthetic environment.

2.5.2.2 Social/Psychological Impacts

The number of people who can comfortably use a given area is an important factor when considering designating an area for recreational use. Users will be generally satisfied with their experience as long as the number of other visitors encountered is not too great and the natures of the different activities carried out are not incompatible. The acceptable number of visitors depends on the nature of the activity (Manning, 1986). Space on the river should therefore be appropriate for the type of recreational activities to be carried out and there should be little likelihood of conflict between different user groups.

The evaluation has focused on the amount of space available for the major activities and the potential for conflict between user groups.

2.6 Integrity Guidelines and Values

The CHRS guidelines for the selection of Canadian Heritage Rivers describe principles pertaining to the inclusion of nominated rivers in the CHRS. One of the principles states that nominated rivers will be included if they meet one or more of the heritage value guidelines and all integrity guidelines.

The integrity guidelines provide direction in evaluating the integrity of study rivers. This is necessary due to the possibility of a CHRS candidate having a high value rating under one of the three heritage value guidelines, but having low integrity value. The various aspects related to evaluating the integrity of study rivers are discussed below.

2.6.1 General Integrity Guidelines

The CHRS general integrity guidelines state that heritage rivers:

- should be of sufficient size and contain all or most of the key interrelated and interdependent elements to demonstrate the key aspects of the processes, features, activities or other phenomena which give the river its outstanding value;

- should contain those ecosystem components required for the continuity of the species, features or objects to be protected; and

- the quality of water should be such as to provide for the continuity and/or improvement of the resources upon which "value" to the system has been determined.

In addition to meeting the heritage value guidelines and the general integrity guidelines, for a river to be judged to have outstanding Canadian heritage or recreational value, it must possess specific integrity values associated with each of the natural heritage, human heritage, and recreational value selection guidelines.

2.6.2 Natural Integrity Values

For a river to be judged to have outstanding Canadian natural heritage value it must possess the following natural integrity values:

- rivers should not have any man-made impoundments within the nominated section;

- all key elements and ecosystem components must be unaffected by impoundments located outside the nominated section;

- natural values for which a river is nominated must not have been created by impoundments;

- the river's outstanding natural heritage features and key elements of ecosystems must be unimpaired by human land uses; and

- the river's water must be uncontaminated to the extent that its natural aquatic ecosystem is intact.

2.6.3 Historical Integrity Values

For a river to be judged to have outstanding Canadian human heritage value, it should possess all of the following historical integrity values:

- in every case consideration should be given to the state of preservation of the river environment relative to its visual appearance during the historic period in which the waterway is considered to be of outstanding importance:

- most of its regime should have the same visual appearance as it had during the period of the river's historical importance; and

- most of the artifacts comprising the values for which the river is nominated must be unimpaired by impoundments and human land uses.

- neighbouring land uses must not seriously affect the historical experience offered by the river environment.

2.6.4 Recreational Integrity Values

For a river to be judged to have outstanding Canadian recreational value it should possess water of a quality suitable for those recreational opportunities for which it is nominated.

- the biophysical quality of the water must be suitable for non-contact recreation.

2.6.5 Application of Integrity Guidelines

For each set of integrity values the evaluation system has focused on the proportion of the river that meets the integrity guidelines and possesses the specific natural, historical, or recreational values. By assessing the proportion of the river length which possesses particular integrity values, it allows for the possibility of excluding impacted sections from a nomination. Otherwise, non-compliance with the integrity guidelines and values on a section of a river would normally result in precluding the nomination of that river as a whole.

3.0 RIVER HERITAGE VALUES SCORING CRITERIA

3.1 Introduction

The various categories and components comprising the natural, human, and recreational themes reflect the CHRS selection guidelines. The criteria have been developed specifically for determining the values of New Brunswick rivers, but have the flexibility to be applied to rivers in other geographical areas with slight modification. Rating study rivers with the evaluation system allows them to be ranked for each value theme. The scoring criteria developed for evaluating natural heritage, human heritage, and recreational values of the study rivers are presented in the sections which follows.

3.1.1 Scoring Methodology

3.1.1.1 Heritage Values Scoring

a) Application of Classification and Rating Criteria

The scoring method employed is based on the thematic framework described in Section 2.1. Each theme category is comprised of components and sub-components which address the requirements of the specific guidelines.

Classification statements were developed for rating each category, component or subcomponent, as appropriate. Based on the application of the classification statements to the available information, these were rated and assigned scores ranging from 0 to 10.

If the level of information available was not sufficient to allow a score to be determined, then a default value equivalent to the lowest possible score within that criterion was assigned.

Categories, components, and sub-components, and the classification and rating statements initially developed were reviewed by a multi-disciplinary Steering Committee and revised based on the results of the review.

The score achieved by each theme category was calculated by averaging the sum of component/sub-component scores. The scores for natural heritage, human heritage, and recreational values for each river were calculated by summing the category scores for the respective theme.

Score adjustments are necessary at several steps in the application of the river evaluation system. These include adjustment factors for component or sub-component scores and indexing of heritage and recreational value scores. These are described in the remainder of this section. An example of the scoring procedure is provided in Appendix E.

b) Adjustment Factors

Adjustment factors have been applied at the following steps: natural heritage value - water quality score; human heritage value - final human heritage score; recreational value - canoeing/kayaking and hunting scores.

Natural Heritage Value Adjustment - Water Quality Score

Natural water quality characteristics were rated using the criteria to determine an initial score. Then an adjustment factor was applied based on the number of the selected water quality parameters which are in compliance with guidelines for the protection of freshwater aquatic life to determine the final score. The parameters selected for examination may be found to be in partial non-compliance (i.e., exceed the guidelines periodically, but not continually). Therefore, the adjustment factor was applied as follows: no non-compliance parameters resulted in a factor of 1; 1 to 2 parameters resulted in a factor of 0.9; 3 to 4 parameters resulted in a factor of 0.8; and 5 or more resulted in a factor of 0.7.

Human Heritage Value Adjustment - Final Score

Final human heritage scores were adjusted by a factor which credits the river for its state of preservation. The adjustment factor has been applied as follows: if the examples cited physically exist and the environment is such that a sense of history is not negatively affected, the factor was 1; if the examples cited exist in such a way that a sense of history is appreciable, the factor was 0.9; if the examples cited or the general area are unidentifiable, or the site is in such a condition as to remove any sense of history, the factor was 0.8.

Recreational Value Adjustment - Canoeing/Kayaking and Hunting Scores

The recreational value sub-components of canoeing/kayaking and hunting were rated by their respective criteria to determine an initial score. A weighting adjustment factor has been applied to reflect the relative importance of each of these to the recreational value of the river. The final scores for canoeing/kayaking and hunting were calculated using an adjustment factor of 2 and 0.5, respectively.

c) Score Index

The CHRS selection guidelines attribute equal significance to natural heritage, human heritage, and recreational values of a river. Therefore, each of these themes have been considered as equally important in evaluating the study rivers.

In the river value rating system the natural heritage, human heritage, and recreation value are scored using different numbers of components. Natural heritage value is determined by adding the scores achieved in each of 5 categories; human heritage, 4 categories; recreational value, 2 categories. Because each category is scored out of a maximum score of 10, natural heritage value is scored out of 50, human heritage value out of 40, and recreational value out of 20. Therefore, the scores of human heritage value and recreational value are indexed to 50 so that the three theme scores can be compared and manipulated on an equal basis. The indices for the human heritage value score and recreational value score are, therefore, 1.25 and 2.5, respectively.

3.1.1.2 Integrity Values Scoring

The assessment of integrity was based upon the proportion of the length of the river which appeared to meet the integrity guidelines and possessed the specific natural, historical, or recreational values. An integrity rating, ranging from 0 to 1, was determined for each of the integrity values by giving a numerical value of 0.1 for each 10 percent portion of the river length which was in compliance.

Within each of natural, historical, and recreational integrity values, the rating achieved by each component value was additive for the sections of river affected. For example, if 80 percent of a river was impounded and 10 percent of another section had severe water quality degradation, the river received a rating of 0.1 for natural integrity. This method has been applied equally for each set of integrity values.

3.2 Natural Heritage Values Scoring

The natural heritage values scoring criteria provide a means for determining whether a river meets the guidelines for natural heritage values outlined by the CHRS. The criteria have been developed to describe and rate the natural attributes of New Brunswick rivers in particular and are discussed in Section 2.3. The scoring system is summarized in Table 3-1. Classification statements pertain to the river environment.

TABLE 3-1
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Geological Development	Physiography		- has representation of three or more physiographic regions.	10
			- has representation of two physiographic regions.	7
			- exists within one physiographic region.	3
	Bedrock Geology		- has representation of several geologic eras with excellent representation of geologic periods in each.	10 to 9
			- has representation of several geologic eras with very good representation of periods in each.	8 to 7
			- has representation of one geologic era with at least half of possible geologic periods, representation of several rock groups and/or formations; representation of major geologic events.	6 to 5
			- has representation of one geologic era with less than half of possible geologic periods; representation of several rock groups and/or formations; representation of major geologic events.	4 to 3
			- has representation of one geologic era with one geologic period; representation of several rock groups and/or formations; representation of major geologic events.	2 to 1

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Geological Development	Palaeontology		- contains several unique and/or rare fossils.	10
			- contains a unique and/or rare fossils.	7.5
			- contains several types of common/interesting fossils.	5
			- contains one type of common fossil.	2.5
			- has no known fossils.	0
	Surficial Geology	Development	- has excellent representation of pre-glacial, glacial, and post-glacial history (6 stages); excellent representation of diverse surficial sediments.	10 to 9
			- very good representation of pre-glacial, glacial, and post-glacial history (5 stages); very good representation of diverse surficial sediments.	8 to 7
			- has good representation of surficial development (4 stages); good representation of surficial sediments.	6 to 5
			- has representation of 2-3 stages of surficial development; good representation of surficial sediments.	4 to 3

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Geological Development	Surficial Geology	Development	- has representation of 1 stage of surficial development; good representation of surficial sediments.	2 to 1
		Features	- has representation of 7 or more types of surficial features.	10
			- has representation of 5 to 6 types of surficial features.	7.5
			- has representation of 3 to 4 types of surficial features.	5
			- has representation of 1 to 2 types of surficial features.	2.5
			- has no distinguishable surficial features.	0
Ongoing Processes	Hydrology		- has excellent representation of unusual or significant hydrologic characteristics of large rivers with natural flow, excellent representation of variable hydrologic conditions; excellent hydrologic features strongly associated with rivers.	10 to 9

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Ongoing Processes	Hydrology		- has very good representation of natural hydrologic characteristics of large river basins in the drainage region; very good representation of variable hydrologic conditions; very good representation of hydrologic features strongly associated with rivers.	8 to 7
			- has good representation of natural hydrologic characteristics of rivers in the drainage region; good presentation of variable hydrologic conditions; good representation of hydrologic features associated with rivers.	6 to 5
			- has little variability in hydrologic characteristics; poor representation of associated hydrologic features.	4 to 3
			- features significantly altered by man; regulated flow.	2 to 1
	Water Quality		- represents an exception to the dominant water type classification of surface waters in the drainage region; exhibits large variation of natural water quality conditions along its course.	10 to 9

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Ongoing Processes	Water Quality		- represents an exception to the dominant water type classification of surface waters in the drainage region; exhibits some variation of natural water quality conditions.	8 to 7
			- represents the dominant water type classification of surface waters in the drainage region; exhibits large variation of natural water quality conditions.	6 to 5
			- represents the dominant water type classification of surface waters in the drainage region; exhibits some variations of natural water quality conditions.	4 to 3
			- insufficient data available for assessment.	2 to 1
	Morphology		- has excellent representation of diverse morphological features associated with both rapidly-moving and slow-moving streams.	10 to 9
			- has very good representation of a variety of morphological features associated with rapidly-moving or slow-moving streams.	8 to 7
			- has good representation of a variety of morphological features associated with rapidly-moving or slow-moving streams.	6 to 5
			- has representation of some morphological features typically associated with rapidly-moving or slow-moving streams.	4 to 3

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Ongoing Processes	Morphology		- has little variety of morphological features	2 to 1
	Vegetation	Features	- has excellent representation of forest ecoregions, organic sediments and wetlands with unique ecosystems identified.	10 to 9
			- has very good representation of forest ecoregions, and organic sediments or unique ecosystems.	8 to 7
			- has good representation of forest ecoregions and wetlands.	6 to 5
			- has representation of forest ecoregions and a unique ecosystem.	4 to 3
			- has no special features associated with forest ecoregions.	2 to 1
		Alteration	- altered little by man, < 20 percent length.	10 to 9
			- altered somewhat by man, 20-40 percent length.	8 to 7
			- moderately altered by man, 40-60 percent length.	6 to 5
			- heavily altered by man, 60-80 percent length.	4 to 3
			- severely altered by man, >80 percent length.	2 to 1

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Ongoing Processes	Wildlife		- has excellent representation of diverse wildlife species strongly associated with both rapidly-moving and slow-moving streams; excellent representation of diverse wildlife species utilizing habitats associated with both rapidly-moving and slow-moving streams; provides critical habitat for a river-dependent species.	10 to 9
			- has very good representation of diverse wildlife species strongly associated with rapidly-moving or slow-moving streams; very good representation of diverse wildlife species in large, undisturbed habitats associated with rapidly-moving or slow-moving streams; provides critical habitat for a species strongly associated with the river.	8 to 7
			- has good representation of wildlife species strongly associated with a rapidly-moving or slow-moving stream, good representation of wildlife diversity in habitats associated with the river.	6 to 5
			- has typical wildlife species associated with a rapidly-moving or slow-moving stream, but not a special representation.	4 to 3

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Ongoing Processes	Wildlife		- has poor representation of wildlife species strongly associated with a rapidly-moving or slow-moving stream; wildlife populations severely altered by man.	2 to 1
Natural Phenomena			- has excellent representation of many highly distinguishable natural phenomena; excellent representation of many unique and/or rare river features.	10 to 9
			- has very good representation of highly distinguishable natural phenomena; very good representation of several unique and/or rare river features.	8 to 7
			- has representation of distinguishable natural phenomena; representation of a unique and/or rare feature.	6 to 5
			- no distinguishable natural phenomena.	4
Natural Beauty			- contains highly distinguishable landforms/landscape; excellent representation of varied vegetation patterns; many natural phenomena; excellent opportunity for viewing features.	10 to 9

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Natural Beauty			- contains several landforms/landscape; very good representation of varied vegetation patterns; very good representation of various natural phenomena; very good opportunity for viewing features.	8 to 7
			- has good representation of the above characteristics.	6 to 5
			- has few examples of interesting landforms/ landscapes or varied vegetation patterns; few natural phenomena.	4 to 3
Biota	Rare/Endangered/ Threatened Species		- utilized by two or more species declared endangered under the New Brunswick Endangered Species Act.	10
			- utilized by a species declared endangered under the Act.	9
			- utilized by several species otherwise considered to be endangered but not declared under the Act and species considered rare or threatened.	8 to 7
			- utilized by several species considered to be rare or threatened.	6 to 5
			- utilized by rare or threatened species.	4 to 3
			- has biota of no special status.	2 to 1

TABLE 3-1 (Continued)
Natural Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Biota	Species Concentration		- has concentrations of greater than 80 percent of the number of identified river-dependent species and species strongly associated with the river.	10 to 9
			- has concentrations of 60 percent to 80 percent.	8 to 7
			- has concentrations of 40 percent to 60 percent.	6 to 5
			- has concentrations of 20 percent to 40 percent.	4 to 3
			- has concentrations of 20 percent or less.	2 to 1

3.3 Human Heritage Values Scoring

The human heritage values scoring criteria are based on "whether or not" there are examples of certain types of sites, structures, individuals, or concepts associated with a river environment. The abundance of these sites, their antiquity, relative importance, and diversity can be evaluated by applying the scoring criteria. For a river to score within any level of a criterion, it must have all of the attributes of that level, unless otherwise indicated.

The human heritage criteria are discussed in Section 2.4. The scoring system is summarized in Table 3-2. Classification statements pertain to the river environment.

3.3.1 Historical Development

Under Native Peoples, for a river to score at a given level it must have all the attributes or points of that level, unless otherwise indicated. If a river does not meet all the criteria of a level, it is assessed against the next level of criteria. This procedure is followed until a river meets all the criteria of a level, or the lowest level is reached.

3.3.2 Persons/Concepts

Under Persons/Concepts an initial screening of the type and strength of associations eliminated examples that were not applicable. For a river to score highly in the Persons/Concepts category it was necessary that the number and variety of associations, as stated in that level of criteria, were present. The overall strength of these associations

TABLE 3-2
Human Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Historical Development	Native Peoples		- is known to contain examples of archaeological sites or evidence from the paleo, archaic, ceramic, Native contact and Native historic periods and is thought to have been utilized for resource procurement and is known to exhibit examples of religious or ceremonial beliefs or concepts, mortuary practises, and was the location of significant singular events in Native culture and is thought to have been used as a migration or canoe route, connects with other river systems or has known meeting places and contains examples of major Native settlements and exhibits evidence of trade networks.	10
			- is known to contain examples or evidence of paleo or archaic and other period sites and was utilized for resource procurement and is known to exhibit examples of religious or ceremonial beliefs or concepts, or examples of mortuary practises, or locations of significant singular events in Native culture and is thought to have been used as a migration route, or a canoe route or contains portages and meeting places and contained Native settlements.	9 to 7

TABLE 3-2 (continued)
Human Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Historical Development	Native Peoples		- contains prehistoric sites, antiquity may be undetermined and was used as a canoe route or probably played a role in migration or hunting patterns and based on known collections, historical documentation, archaeological field work, other sources and predictive models, has good potential for undiscovered prehistoric archaeological sites.	6 to 5
			- contains prehistoric sites and based on historical documentation was utilized by native groups.	4 to 2
			- has no known sites; there are no known collections from the area.	1
	Settlement Patterns		- is known to contain settlements that were established or grew because of their importance as a trading location, a military establishment, a preferred agricultural area; a junction of transportation routes, or its location along a transportation route; an industrial or commercial or business centre; and an entry or exit point or settling area for significant numbers of one of the following groups: Acadians, Scots, Irish, Loyalists, Dutch, Germans, Welsh, English, Blacks, or other cultural groups; and centres of military or scientific exploration from which expeditions took place or specific sites associated with exploration or military ventures; and a resource utilization location that has significance in the river's history.	10 to 7

TABLE 3-2 (continued)
Human Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Historical Development	Settlement Patterns		- is known to contain settlements that were either a military or trading establishment; an entry or exit point or settling area for significant numbers of a cultural group; and a business which contributed to the initial development of a settlement.	6 to 4
			- is known to contain settlements that were established or grew because of military or agricultural reasons, or natural resource utilization; and was associated with the entry or exit point or the settlement of significant numbers of a cultural group.	3 to 1
	Transportation		- played an important role in the transport of people or goods between North America and Europe; and played an important role in the transport of people or goods within New Brunswick; and was an important New Brunswick shipbuilding locality, or is associated with a distinct vessel type; and has settlements on, or at the beginning or terminus of a major ship, rail, or other transportation route; associated with the transport industry by supplying or housing the machinery or individuals travelling or working on these modes of transport; and has examples of shipwrecks or ship remains or artifacts associated with the transport industry that are not common.	10 to 7

TABLE 3-2 (continued)
Human Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Historical Development	Transportation		- played an important role in the transport of people or goods between North America and Europe or within New Brunswick or was a shipbuilding locality; and had settlements on, or at the beginning or terminus of a major ship, rail, or other transportation route or been associated with the transport industry by supplying or housing the machinery or individuals travelling or working on these modes of transport.	6 to 4
			- played a role in the transport of people and goods within New Brunswick; or had a major ship, rail, or another transportation route; or was associated with the transport industry supplying or housing the machinery or individuals travelling or working on these modes of transport.	3 to 1
Persons/Concepts			- is associated with the development of political movements or the emergence and development of ethnic traditions; and the development of ideas of Canadian significance, or the practise of beliefs of religious or other significance; and a person or group that	10 to 6

TABLE 3-2 (continued)
Human Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Persons/Concepts			stands out in New Brunswick's history for their participation or achievement in any of the following areas: religion, sports, politics, business, military matters, education, agriculture, entrepreneurship, or other areas of significant achievement or failure; and a special place, site, or location that is unique or important for the special role it has played in New Brunswick's history, or a singular event which stands out as contributing to the history of that area.	
			- is associated with the development of political movements or ethnic traditions or the practise of beliefs of religious or other significance; or a person or group that stands out in New Brunswick history for their participation in any of the following areas: religion, sports, politics, business, military matters, education, agriculture, entrepreneurship or other area of significant achievement or failure; or a special place, site, or location that is unique or important for the special role it has played in New Brunswick's history, or a singular event which stands out as contributing to the history of that area.	5 to 1
Rare Finds			- is known to contain archaeological or historical sites or structures which are unique, rare, or of significant antiquity at the provincial level.	10 to 6

TABLE 3-2 (continued)
Human Heritage Values Scoring

Category	Component	Subcomponent	Classification	Score
Rare Finds			- is known to contain one or more of prehistoric or historic sites or structures; artifact collections; archaeological features that may or may not relate to a site, but still exhibit its own archaeological context; and/or artifact scatters or isolated finds.	5 to 1
Themes in Canadian History			- is known to contain outstanding examples or concentrations of prehistoric or historic structures, works or sites which are representative of major themes in Canadian history.	10 to 6
			- is known to contain examples, or concentrations of prehistoric or historic structures, works or sites which are representative of themes in Canadian or New Brunswick history.	5 to 1

was reflected by selecting either the higher or lower end of the point range. Rivers that did not have the variety necessary for the first level were relegated to the second level. The strength of association(s) determined where it scored in the point range.

3.3.3 Rare Finds

Under Rare Finds, upper level scoring was based on the significance, number and diversity of the rare finds. Lower level scoring was based on the number of criteria present for each river.

3.4 Recreation Values Scoring

The recreational values scoring criteria recognize the aquatic-terrestrial-human interaction essential to recreation. Water-related outdoor activities require both a pleasant natural environment and the physical essentials necessary for the activity to be executed safely and effectively. The recreational evaluation criteria are discussed in Section 2.4. The scoring system is summarized in Table 3-3. Classification statements pertain to the river environment.

TABLE 3-3
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Range of Appropriate Activities	Canoeing/kayaking	- sufficiently long stretches of river allow extended trips, campsites evenly dispersed along the river, several sets of class II through IV rapids challenge most intermediate and advanced canoeists, some stretches of river with no rapids for the beginner and leisurely paddler, portaging, where necessary, possible for all canoeists.	10 to 9
			- some stretches of river sufficiently long to allow extended trips and/or many stretches allow for trips of three to five days in length, campsites evenly dispersed along the river, some sets of class II through III rapids challenge most intermediate paddlers, several stretches of river with no rapids for the beginner and leisurely paddler, portages, where necessary, are usually possible for all canoeists.	8 to 7
			- several stretches of river allow for trips of three to five days in length, campsites are sometimes available along the river, occasional sets of class I to II rapids, many stretches of river with no rapids for the beginner and leisurely paddler, portages, where necessary, are usually possible.	6 to 5

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Range of Appropriate Activities	Canoe/kayaking	- few stretches of the river allow trips of more than one day in length, campsites may not be available, some sections of the river may have level III to VI rapids which is beyond the ability of many paddlers, and/or little variety in rapids sequences or no fast water at all, some locations where portages may be necessary but difficult or impossible.	4 to 3
			- overnight canoe/kayak trips rarely, if ever, possible, campsites rarely or not available, no fast water, and/or rapids too difficult for almost all paddlers (Class IV to VI), portages usually not available or too difficult.	2 to 1
		Sport Fishing	- opportunities for fishing very good to excellent. Adequate fish population to support sport fishing and contains two or more of the common sport fishing species (i.e., salmon, trout, bass, etc.).	10 to 8
			- opportunities for fishing moderate or good; fish population is adequate to support sport fishing in some sections of the river and contains at least one of the common sport fishing species (i.e., salmon, trout, bass, etc.).	7 to 4
			- opportunities for fishing poor; does not have an adequate fish population to support sport fishing and/or does not contain any common sport fishing species.	3 to 1

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Range of Appropriate Activities	Hunting	- opportunities for hunting very good to excellent; many sections of the river provide access to remote areas where large game may be found, or facilitates the hunting and/or trapping of large or small mammals, waterfowl, or other game.	10 to 8
			- opportunities for hunting moderate to good; some sections of the river provide access to remote areas where large game may be found, or facilitates the hunting and/or trapping of large or small mammals, waterfowl, or other game.	7 to 4
			- opportunities for hunting poor or non-existent; few, if any, sections of the river provide access to hunting areas, or hunting is prohibited.	3 to 1
		Intensive Recreation	- all or almost all of the river environment suitable for recreation and a wide range of related water- and land-based activities.	10 to 9
			- many stretches of the river and river environment suitable for recreation, and several different activities (both land- and water-based).	8 to 7
			- some stretches of the river and river environment are suitable for recreation, but with a limited number of activities.	6 to 5

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Range of Appropriate Activities	Intensive Recreation	- few stretches of the river and river environment suitable for recreation, and/or only one or two different activities possible.	4 to 3
			- recreation along the river and river environment either impossible and/or the river is not suited to the recreational activities.	2 to 1
		Human Heritage Appreciation	- outstanding potential for historical or cultural appreciation; sites or regions of historical or cultural significance and interest exist at a minimum of two different locations along the river.	10 to 8
			- moderate to good potential for historical or cultural appreciation; sites or regions of historical or cultural significance and interest exist at a minimum of one location along the river.	7 to 4
			- fair to poor potential for historical or cultural appreciation; few or no sites of historical or cultural significance exist or the sites are not visible and/or open or available to the public.	3 to 1
	Natural Values	Natural Attractions	- many stretches of the river exhibit varied, striking landforms, and/or pattern changes, and/or concentration of natural phenomena, and/or excellent opportunities for viewing wildlife.	10 to 8

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Natural Values	Natural Attractions	- landforms and/or natural phenomena and/or opportunities for viewing wildlife are interesting but typical on some stretches of the river.	7 to 4
			- landforms are uninteresting, natural phenomena is unexceptional, and/or there are few or no opportunities for viewing wildlife along most or all of the river.	3 to 1
		Solitude/ Backcountry	- provides a sense of remoteness and opportunities for solitude, most stretches of river have an absence of roads, structures, power lines, litter, etc.; few, if any contacts with other people.	10 to 9
			- several stretches of the river provide feeling of remoteness and opportunities for solitude; roads, power lines, structures, etc. may be visible but unobtrusive; contacts with other people will occur infrequently.	8 to 7
			- occasional opportunities for experiencing solitude; contact with other people is likely; structures will be in evidence, human intervention is non-industrial and rural in nature.	6 to 5

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Natural Values	Solitude/ Backcountry	- few opportunities for experiencing solitude; contact with other people frequent and occasional crowding may occur; structures may be both rural and industrial in nature.	4 to 3
			- no opportunities for experiencing solitude; many permanent structures in evidence, and industrial in nature; is often over-crowded.	2 to 1
	Physical Factors	Water Flow	- depth, speed, and width is sufficient to allow navigation during most or all of every year.	10 to 8
			- depth, speed, and width is sufficient to allow navigation during some parts of most years.	7 to 4
			- depth, speed, and width is rarely sufficient to allow navigation.	3 to 1
		Navigability	- no or very few obstructions (waterfalls, rocks, logs, trees, rapids, sand bars, dams/ impoundments, low bridges, etc.) which might limit navigability; where obstacles exist which completely block the river, a portage is always possible.	10 to 9
			- occasional obstructions which might limit navigability for most crafts; where obstacles exist which completely block the river, a portage is usually possible.	8 to 7

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Physical Factors	Navigability	- some obstructions which would limit navigability for all crafts; where obstacles exist which completely block the river, a portage is sometimes possible.	6 to 5
			- numerous obstructions which would limit navigability for all crafts; where obstacles exist which completely block the river, a portage is only occasionally possible.	4 to 3
			- many obstructions which completely block the river, or river is impassable; portages are rarely, if ever possible.	2 to 1
		Access	- road access and launching points good to excellent; access points appropriately dispersed along the river; launching areas suitable for both small and large crafts.	10 to 8
			- road access and launching points fair to good; access points available along some stretches of the river; launching areas suitable for both small to mid-sized crafts.	7 to 4
			- road access and launching points poor; access limited or non-existent; launching points, where available, are suitable only for small boats.	3 to 1
		Water Quality	- appearance of the water in terms of colour, odour, aquatic vegetation, turbidity, and presence of solid wastes is acceptable for both contact and non-contact recreational use.	10 to 8

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Physical Factors	Water Quality	- appearance of the water in terms of colour, odour, aquatic vegetation, turbidity, and presence of solid wastes is acceptable for non-contact recreational use only.	7 to 3
			- appearance of the water in terms of colour, odour, aquatic vegetation, turbidity, and presence of solid wastes is unacceptable for any type of recreational use.	2 to 1
		Shoreline	- excellent for all or most recreational purposes; slope, vegetation, drainage, and terrain appropriate for all recreational activities along most or all stretches of the river.	10 to 9
			- good to very good for many recreational purposes; slope, vegetation, drainage, and terrain appropriate for all recreational activities along many stretches of the river.	8 to 7
			- acceptable for some recreational purposes; slope, vegetation, drainage, and terrain appropriate for some recreational activities along some stretches of the river.	6 to 5
			- shoreline quality is fair; slope, vegetation, drainage, and terrain may be appropriate for only one or two recreational activities, or are inappropriate along many stretches of the river.	4 to 3

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Capabilities	Physical Factors	Shoreline	- shoreline quality is poor; slope, vegetation, drainage, and terrain are inappropriate for recreational activities along most or all of the river.	2 to 1
Impacts/ Sensitivities	Physical/Ecological Impacts		- recreational use will have little or no detrimental effect on the majority of sections of the river.	10 to 9
			- recreational use will have limited detrimental effect on most sections of the river and river environment; where negative impact is possible, it will not inhibit a natural process, or permanently alter the natural, historic, or aesthetic environment.	8 to 7
			- recreational use will have some detrimental effect on several sections of the river and river environment; where negative impact is likely, it may cause long-term or permanent damage to the natural, historic or aesthetic environment.	6 to 5
			- recreational use will likely have serious negative impact on several sections of the river and river environment; where negative impact is likely, it will cause long-term or permanent damage to the natural, historic, or aesthetic environment.	4 to 3

TABLE 3-3 (Continued)
Recreational Values Scoring

Category	Component	Subcomponent	Classification	Score
Impacts/ Sensitivities	Physical/Ecological Impacts		- recreational use will definitely have a serious negative impact on the river and river environment; this impact will cause permanent damage to the natural, historic, or aesthetic environment.	2 to 1
	Social/Psychological Impacts		- river corridor is wide and the river may be winding; the available space is more than adequate for the type(s) of activities to be carried out; there is little or no chance of conflict between activity groups.	10 to 8
			- river corridor is limited and space is adequate only on some sections of the river; there is some chance of conflict between activity groups.	7 to 4
			- river corridor is restricted and space is insufficient on most or all sections of the river; likelihood of conflict between activity groups is high.	3 to 1

4.0 ASSESSMENT OF STUDY RIVER VALUES

This chapter contains the results of the assessment of natural heritage value, human heritage value, recreational value, and integrity value for each of the study rivers.

4.1 River Heritage Value Assessment

The natural heritage, human heritage, and recreational values of each river have been determined through the application of the rating criteria described previously. An example of the scoring procedure is presented in Appendix E, using the Nashwaak River as an illustration. The detailed results of the assessment of each river and the scoring rationale follow at the end of this chapter.

For the purpose of determining potential candidates for nomination to the CHRS and rivers meriting considerations as Provincial heritage resources, with outstanding heritage value, the ranking of study rivers with respect to each of the heritage value guidelines and various combinations of these have been considered. The assessment results presented in this section represent the raw value scores achieved, excluding the integrity value assessment which is presented in Section 4.2.

Tables 4-1 through 4-5 contain a summary of the results of the river heritage value assessment and ranking for natural heritage value, human heritage value, recreational value, natural heritage and human heritage values combined and multiple heritage values (natural, and human and recreational combined), respectively.

TABLE 4-1

Natural Heritage Value Scores

RANK	RIVER	SCORE
1	Lower Saint John	40.6
2	Southwest Miramichi	40.1
3	Oromocto	39.1
4	Nepisiguit	36.1
5	Kennebecasis	36.0
6	Middle Saint John	35.1
7	Northwest Miramichi	34.3
8	Restigouche	34.1
9	Kedgwick	33.5
10	Portobello	33.3
11	Tobique	33.1
12	Upsalquitch	32.6
13	Little Southwest Miramichi	32.5
14	Magaguadavic	32.1
15	Petitcodiac	31.9
16	Tetagouche	31.4
17	Patapedia	31.0
18	Eel	30.8
19	Richibucto	29.8
20	Dungarvon	28.6
20	Upper Saint John	28.6
21	Cains	28.2
22	Nashwaak	27.9
23	Kouchibouguac	26.8

TABLE 4-2

Human Heritage Value Scores

RANK	RIVER	SCORE
1	Lower Saint John	44.4
2	Northwest Miramichi	37.1
3	Southwest Miramichi	35.3
4	Little Southwest Miramichi	30.9
5	Middle Saint John	28.5
6	Nashwaak	26.6
7	Petitcodiac	26.3
8	Restigouche	24.8
9	Kennebecasis	22.5
10	Upper Saint John	20.3
11	Richibucto	18.4
12	Oromocto	18.0
13	Eel	16.5
14	Nepisiguit	15.0
15	Tobique	13.9
16	Cains	13.8
17	Tetagouche	12.8
18	Magaguadavic	11.6
19	Kouchibouguac	8.8
20	Portobello	6.6
21	Dungarvon	6.3
22	Upsalquitch	5.4
23	Kedgwick	5.0
23	Patapedia	5.0

TABLE 4-3

Recreational Value Scores

RANK	RIVER	SCORE
1	Nashwaak	41.0
2	Kennebecasis	40.8
2	Richibucto	40.8
3	Upper Saint John	40.0
4	Tobique	39.8
5	Oromocto	39.3
5	Northwest Miramichi	39.3
6	Dungarvon	39.0
6	Magaguadavic	39.0
6	Southwest Miramichi	39.0
7	Lower Saint John	38.8
8	Patapedia	38.5
9	Middle Saint John	38.0
10	Tetagouche	37.3
11	Kedgwick	36.3
12	Nepisiguit	35.5
13	Cains	34.8
13	Little Southwest Miramichi	34.8
14	Eel	33.8
15	Kouchibouguac	33.3
16	Upsalquitch	32.8
17	Portobello	30.5
18	Petitcodiac	28.5
19	Restigouche	27.3

TABLE 4-4

Natural Heritage and Human Heritage Values Scores

RANK	RIVER	COMBINED SCORE
1	Lower Saint John	85.0
2	Southwest Miramichi	75.4
3	Northwest Miramichi	71.4
4	Middle Saint John	63.6
5	Little Southwest Miramichi	63.4
6	Restigouche	58.9
7	Kennebecasis	58.5
8	Petitcodiac	58.2
9	Oromocto	57.1
10	Nashwaak	54.5
11	Nepisiguit	51.1
12	Richibucto	48.2
13	Eel	47.3
14	Tobique	47.0
14	Upper Saint John	47.0
15	Tetagouche	44.2
16	Magaguadavic	43.7
17	Cains	42.0
18	Portobello	39.9
19	Kedgwick	38.5
20	Upsalquitch	38.0
21	Patapedia	36.0
22	Kouchibouguac	35.6
23	Dungarvon	34.0

TABLE 4-5

Multiple Heritage Values Scores

RANK	RIVER	COMBINED SCORE
1	Lower Saint John	123.8
2	Southwest Miramichi	114.4
3	Northwest Miramichi	110.7
4	Middle Saint John	101.6
5	Kennebecasis	99.3
6	Little Southwest Miramichi	98.2
7	Oromocto	96.4
8	Nashwaak	95.5
9	Richibucto	89.0
10	Upper Saint John	88.9
11	Tobique	86.8
12	Petitcodiac	86.7
13	Nepisiguit	86.6
14	Restigouche	86.2
15	Magaguadavic	82.7
16	Tetagouche	81.5
17	Eel	81.1
18	Cains	76.8
19	Kedgwick	74.8
20	Patapedia	74.5
21	Dungarvon	73.9
22	Upsalquitch	70.8
23	Portobello	70.4
24	Kouchibouguac	68.9

Upon examining the ranked scores, it can be seen that there is no large point spread in any of the rankings, for delineating a threshold to define the best rivers. However, for natural heritage value, there is a three-point gap between the rivers ranking third and fourth which indicates slight distinction for the top three rivers. Again, for human heritage value, the top three rivers are more widely separated from other rivers than those ranked below these. Rivers ranked for recreational value were narrowly separated from one another, with ten rivers ranked in the top six having a score range of only 2 points. Because there is no obvious threshold for delineating the best rivers for each value or values combination, those in an arbitrarily determined range of high ranking may be considered.

From an examination of the top-ten rankings in each table presented, the following observations are made: the Lower Saint John, Middle Saint John, Kennebecasis, Southwest Miramichi, and Northwest Miramichi rivers consistently rank in each; the Oromocto River ranks in all but human heritage value; the Nashwaak River ranks in all but natural heritage value; the Restigouche River ranks in all but recreational and multiple heritage values; the Upper Saint John River ranks in all but natural heritage values and the combination of natural and human heritage values; the Little Southwest Miramichi ranks in all but natural and recreational; the Petitcodiac River ranks in human and multiple heritage values; and the Richibucto River ranks in recreational and multiple heritage values. The other rivers which rank in the top-ten of one heritage value or combination are: the Nepisiguit, Kedgwick, and Portobello rivers - natural; the Tobique, Dungarvon, Magaguadavic Patapedia, and Tetagouche rivers - recreational.

4.2 River Integrity Value Assessment

Twelve rivers were assessed as not possessing the natural and/or historical values required to meet their respective integrity guidelines. All rivers appear to meet the recreational integrity guidelines. Rivers which do not meet the integrity guidelines are presented in Table 4-6 with their achieved rating and a description of the contributing factors.

TABLE 4-6
Integrity Ratings

RIVER	INTEGRITY VALUE	RATING FACTOR	DESCRIPTION
Petitcodiac	Natural	0.72	Approximately 28 percent of river impounded.
	Historical	0.65	Visual appearance of regime altered.
Tobique	Natural	0.89	Approximately 11 percent of river impounded.
	Historical	0.86	Visual appearance of regime altered and neighboring land use detracts from historical experience.
Restigouche	Natural	0.88	Water quality deterioration in Tidehead to Campbellton area.
	Historical	0.88	Visual appearance altered and artifacts impaired by land use in Tidehead to Campbellton area.
Kennebecasis	Natural	0.63	Water quality degradation due to municipal, industrial, and agricultural influences.
	Historical	0.92	Neighboring land use detracts from historical experience.
Magaguadavic	Natural	0.9	Approximately 10 percent of river impounded.
	Historical	0.9	Visual appearance of regime altered.
Nepisiguit	Natural	0.9	Approximately 4 percent of river impounded; water quality impacted by mining influences.
	Historical	0.92	Visual appearance altered and neighboring land use detracts from historical experience and impacts artifacts.
Northwest Miramichi	Natural	0.94	Pronounced periodic ongoing water quality degradation due to mining influences.

TABLE 4-6 (Continued)
Integrity Ratings

RIVER	INTEGRITY VALUE	RATING FACTOR	DESCRIPTION
Oromocto	Natural	0.9	Water quality degradation due to organic loading in effluent of hatchery on South Oromocto Lake.
Saint John - Lower	Natural	0.65	Approximately 15 percent of river section affected by impoundment upstream; water quality degradation due to municipal and industrial discharges.
	Historical	0.93	Visual appearance altered and neighboring land use detracts from historical experience on approximately 7 percent of the river.
Saint John - Middle	Natural	0.22	Approximately 68 percent of section impounded; numerous municipal, agricultural, and industrial impacts on water quality along an additional 10 percent of the river.
	Historical	0.32	Visual appearance altered and artifacts impaired by impoundments.
Saint John - Upper	Natural	0.5	Approximately 35 percent of section impounded; water quality degradation in several areas due to municipal, industrial, and agricultural influences.
	Historical	0.62	Visual appearance altered by impoundment and neighboring land use.
Southwest Miramichi	Natural	0.86	Approximately 0.4 percent of river impounded; water quality degradation due to municipal and industrial discharges along approximately 14 percent of the river.
	Historical	0.92	Neighboring land use detracts from historical experiences on approximately 8 percent of the river.

Ten of the rivers listed have an integrity value rating of 0.7 or greater, indicating that relatively large portions of the river could be considered for nomination to the CHRS. Those with ratings less than 0.7 include the Petitcodiac (historical), Kennebecasis (natural), Lower Saint John (natural), Middle Saint John (natural and historical), and Upper Saint John (natural and historical) rivers.

4.3 River Values Integrity Adjustment

The impact of the integrity assessment on the heritage values of study rivers was determined by applying the integrity rating to heritage values scores. Heritage values scores adjusted by the integrity rating are presented in Tables 4-7 through 4-10.

When the natural heritage value scores were adjusted by the integrity rating, the Lower Saint John, Middle Saint John, Kennebecasis, and Restigouche rivers dropped from the top-ten ranking. Eleven rivers were then ranked in the top ten, with new rivers including the Upsalquitch, Little Southwest Miramichi, Tetagouche, Patapedia, and Eel rivers.

Ranking of the human heritage value by the integrity-adjusted scores resulted in the Upper and Middle Saint John rivers dropping from the top-ten ranking. These were replaced by the Richibucto and Oromocto rivers.

When the combined natural heritage and human heritage values scores were adjusted by the integrity ranking, the Middle Saint John, Kennebecasis, and Petitcodiac rivers dropped from the top-ten ranking. These were replaced by the Richibucto, Eel, and Nepisiguit rivers.

Ranking of the multiple heritage value by the integrity-adjusted scores resulted in the Upper and Middle Saint John rivers being dropped from the top-ten ranking. These were replaced by the Nepisiguit and Tetagouche rivers.

4.4 Detailed Results of River Heritage Assessment and Scoring Rationale

The detailed results of the assessment of study rivers for natural heritage, human heritage, and recreational values are presented in Tables 4-11 through 4-25 which follow in the remainder of this section.

TABLE 4-7

Adjusted Natural Heritage Value Scores

RANK	RIVER	HERITAGE SCORE	INTEGRITY RATING	ADJUSTED SCORE
1	Oromocto	39.1	0.90	35.2
2	Southwest Miramichi	40.1	0.86	34.5
3	Kedgwick	33.5	1.00	33.5
4	Portobello	33.3	1.00	33.3
5	Upsalquitch	32.6	1.00	32.6
6	Nepisiguit	36.1	0.90	32.5
6	Little Southwest Miramichi	32.5	1.00	32.5
7	Northwest Miramichi	34.3	0.94	32.2
8	Tetagouche	31.4	1.00	31.4
9	Patapedia	31.0	1.00	31.0
10	Eel	30.8	1.00	30.8
11	Restigouche	34.1	0.88	30.0
12	Richibucto	29.8	1.00	29.8
13	Tobique	33.1	0.89	29.5
14	Magaguadavic	32.1	0.90	28.9
15	Dungarvon	28.6	1.00	28.6
16	Cains	28.2	1.00	28.2
17	Nashwaak	27.9	1.00	27.9
18	Kouchibouguac	26.8	1.00	26.8
19	Lower Saint John	40.6	0.65	26.4
20	Petitcodiac	31.9	0.72	23.0
21	Kennebecasis	36.0	0.63	22.7
22	Upper Saint John	28.6	0.50	14.3
23	Middle Saint John	35.1	0.22	7.7

TABLE 4-8

Adjusted Human Heritage Value Scores

RANK	RIVER	HERITAGE SCORE	INTEGRITY RATING	ADJUSTED SCORE
1	Lower Saint John	44.4	0.93	41.3
2	Northwest Miramichi	37.1	1.00	37.1
3	Southwest Miramichi	35.3	0.92	32.5
4	Little Southwest Miramichi	30.9	1.00	30.9
5	Nashwaak	26.6	1.00	26.6
6	Restigouche	24.8	0.88	21.8
7	Kennebecasis	22.5	0.92	20.7
8	Richibucto	18.4	1.00	18.4
9	Oromocto	18.0	1.00	18.0
10	Petitcodiac	26.3	0.65	17.1
11	Eel	16.5	1.00	16.5
12	Nepisiguit	15.0	0.92	13.8
12	Cains	13.8	1.00	13.8
13	Tetagouche	12.8	1.00	12.8
14	Upper Saint John	20.3	0.62	12.6
15	Tobique	13.9	0.86	12.0
16	Magaguadavic	11.6	0.90	10.4
17	Middle Saint John	28.5	0.32	9.1
18	Kouchibouguac	8.8	1.00	8.8
19	Portobello	6.6	1.00	6.6
20	Dungarvon	6.3	1.00	6.3
21	Upsalquitch	5.4	1.00	5.4
22	Kedgwick	5.0	1.00	5.0
22	Patapedia	5.0	1.00	5.0

TABLE 4-9

Adjusted Natural Heritage and Human Heritage Values Scores

RANK	RIVER	COMBINED ADJUSTED SCORE
1	Northwest Miramichi	69.3
2	Lower Saint John	67.7
3	Southwest Miramichi	67.0
4	Little Southwest Miramichi	63.4
5	Nashwaak	54.5
6	Oromocto	53.2
7	Restigouche	51.8
8	Richibucto	48.2
9	Eel	47.3
10	Nepisiguit	46.3
11	Tetagouche	44.2
12	Kennebecasis	43.4
13	Cains	42.0
14	Tobique	41.5
15	Petitcodiac	40.1
16	Portobello	39.9
17	Magaguadavic	39.3
18	Kedgwick	38.5
19	Upsalquitch	38.0
20	Patapedia	36.0
21	Kouchibouquac	35.6
22	Dungarvon	34.9
23	Upper Saint John	26.9
24	Middle Saint John	16.8

TABLE 4-10

Adjusted Multiple Heritage Values Scores

RANK	RIVER	COMBINED ADJUSTED SCORE
1	Northwest Miramichi	108.6
2	Lower Saint John	106.5
3	Southwest Miramichi	106.0
4	Little Southwest Miramichi	98.2
5	Nashwaak	95.5
6	Oromocto	92.5
7	Richibucto	89.0
8	Kennebecasis	84.2
9	Nepisiguit	81.8
10	Tetagouche	81.5
11	Tobique	81.3
12	Eel	81.1
13	Restigouche	79.1
14	Magaguadavic	78.3
15	Cains	76.8
16	Kedgwick	74.8
17	Patapedia	74.5
18	Dungarvon	73.9
19	Upsalquitch	70.8
20	Portobello	70.4
21	Kouchibouquac	68.9
22	Petitcodiac	68.6
23	Upper Saint John	66.9
24	Middle Saint John	54.8

TABLE 4-11 - CAINS RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	Flows within the Maritime Plain.
Bedrock Geology	1	Representation of one geologic era, one period.
Palaeontology	2.5	Unspecified plant fossils.
Surficial Geology		
Development	3	Representation of two stages of surficial development; marine and morainal sediments.
Features	2.5	Moraine ridges, meltwater channels.
Ongoing Processes		
Hydrology	7	Very good representation of natural hydrological characteristics of large rivers in drainage region, relatively large proportion of drainage area as lakes/wetlands.
Water Quality	2.7	Calcium bicarbonate type; very soft water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	2	Representation of irregular channels and irregular meanders; approximately 58 islands.
Vegetation		
Features	6	Representation of Maritime Lowlands ecoregion; moderate extent of wetlands.
Alteration	7	River environment altered somewhat by man; settlement, forestry.
Wildlife	8	Approximately 15 species of fish; significant solitary sandpiper breeding area; high number of Eastern cougar reports each year on this system.
Natural Phenomena	6	Lower sections of valley have steep slopes, cliffs; rapids; seasonal concentrations of shorebirds and several fish species; fossils present.

TABLE 4-11 - CAINS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Beauty		
Features	9	- Varied channel patterns; many islands; rapids; some natural phenomena; highly distinguishable landforms/landscape.
Alteration	7	- River environment altered somewhat by man; settlement, forestry.
Biota		
Rare/Endangered	9	- Reports of eastern cougar.
Species Concentrations	4	- Spring-summer runs of Atlantic salmon (small run; predominantly grilse), rainbow smelt, brook trout, lamprey; fall run of Atlantic salmon (large run; predominantly grilse); concentrations of breeding solitary sandpiper.
Summary of Average Natural Heritage Scores		
Geological Development	2.3	
Ongoing Processes	5.4	
Natural Phenomena	6	
Natural Beauty	8	
Biota	6.5	
Total	28.2 x (Score Index of 1.0) = 28.2	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	5	- Contains prehistoric sites from several periods, used as a canoe route to the Nashwaak, and the Gaspereau, good potential for archaeological sites to be discovered.
Settlement Patterns	2	- Although forest products and salmon were harvested no settlements on the Cains are known to have developed.
Transportation	2	- Used as a link between the Miramichi and the Saint John systems.

TABLE 4-11 - CAINS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Persons/Concepts	2	- Besides Davidson and his 'Family' and others using this route in the late 1700's to get to Maugerville, little is mentioned about the Cains in the historical record.
Rare Finds	4	- Contains prehistoric sites, features, artifact scatters and has archaeological potential.
Themes in Canadian History	2	- At least one example of a stratified prehistoric site. No historical examples are recognized.
Summary of Average Human Heritage Scores		
Historical Development	3	
Persons/Concepts	2	
Rare Finds	4	
Themes in Canadian History	2	
Total	11 x (Human Heritage Adjustment factor of 1.0) x (Score Index of 1.25) = 13.8	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing/Kayaking	16	- Opportunity for canoeing/kayaking is good. Trips of up to five days are possible. Potential campsites are dispersed at somewhat regular intervals; occasional class II to III rapids sequences exist which challenge intermediate and expert canoeists; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	5	- Opportunity for fishing is fair. Adequate populations of Atlantic salmon for sport fishing along some sections of the river. Upper portion of river closed to trout fishing.
Hunting	4.5	- Opportunity for hunting is very good to excellent. Adequate populations of large and small game exist for hunting along the length of the river. Includes adjustment factor of 0.5.

TABLE 4-11 - CAINS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. A variety of land-based activities and occasional water-based activities may be carried out along most sections of the river.
Human Heritage Appreciation	2	- Opportunity for human heritage appreciation is poor. Only one invisible (unmarked) site of historical significance has been identified (early settlers buried at the mouth of the river).
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Sightings of deer are common and sightings of eastern cougar are rare; landforms are varied and striking; flora is exceptionally beautiful in some areas.
Solitude/Backcountry	6	- Opportunity to experience solitude/backcountry is fair. Hydro wires, roads, litter, and private cabins may be in evidence; potential for contact with other people is high, especially during the months of May and June.
Physical Factors		
Water Flow	5	- Water flow is fair. River depth, speed and width is adequate during May, June, and October of most years.
Navigability	8	- Navigability is good. Obstructions in the form of rocks, logs, and sandbars exist but do not significantly hinder navigability.
Access	7	- Access to river is good. Points of access for small crafts are frequent, but the access points for larger crafts are few or non-existent.

TABLE 4-11 - CAINS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Water Quality	10	- Water quality is good. Appearance with respect to colour, odour, aquatic vegetation, and presence of solid waste along the river is acceptable for both land and water based activities.
Shoreline	7	- Shoreline quality is good for most recreational purposes. Terrain is suitable for parking, camping, and trails. Drainage is good; vegetation is dense; slope varies from steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	5	- Likelihood of negative social/psychological impacts is moderate to high. Conflicts may occur among anglers, canoeists, and camp owners.

Summary of Average Recreational Scores

Capabilities	6.9
Impacts/Sensitivities	7
Total	13.9 x (Score Index of 2.5) = 34.8

TABLE 4-12 - DUNGARVON RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the New Brunswick Highlands and the Maritime Plain.
Bedrock Geology	6	- Representation of one geologic era, five periods; Tetagouche and Kingsclear rock groups.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	4	- Representation of two stages of surficial development; alluvial, organic, glaciofluvial, and morainal sediments.
Features	5	- Moraine ridge, esker, kames or isolated glaciofluvial deposits, meltwater channels.
Ongoing Processes		
Hydrology	6	- Good representation of natural hydrologic characteristics of rivers in drainage region; good representation of variable hydrologic conditions.
Water Quality	3	- Calcium bicarbonate type; soft water; some variation of natural water quality. Includes adjustment factor of 1.0.
Morphology	5	- Representation of irregular channels and irregular meanders; terraces/floodplains; approximately 23 islands and 17 bars.
Vegetation		
Features	7	- Representation of Restigouche, Maritime Uplands and Maritime Lowlands ecoregion; organic sediments; some wetlands.
Alteration	9	- River environment altered little by man; settlement, forestry.
Wildlife	7	- Approximately 12 species of fish; a few significant deer wintering areas.

TABLE 4-12 - DUNGARVON RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Phenomena	6	- Seasonal concentrations of white-tailed deer and several fish species, fossils present.
Natural Beauty		
Features	8	- Variety of vegetation pattern and surficial features; varied topography; some natural phenomena.
Alteration	9	- River environment altered little by man; settlement, forestry.
Biota		
Rare/Endangered	4	- Plants considered rare (*Utricularia minor*).
Species Concentrations	2	- Spring-summer runs of Atlantic salmon (predominantly grilse), brook trout, lamprey; fall run of Atlantic salmon (small run; predominantly grilse;) concentrations of wintering white-tailed deer.
Summary of Average Natural Heritage Scores		
Geological Development	5	
Ongoing Processes	6.1	
Natural Phenomena	6	
Natural Beauty	8.5	
Biota	3	
Total	28.6 x (Score Index of 1.0) = 28.6	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	1	- There are no known sites or known collections from the area.
Settlement Patterns	1	- Settlements not established for military, agricultural, transportation reasons. No significant settlement by ethnic groups.
Transportation	1	- Not important for transportation of people or goods.

TABLE 4-12 - DUNGARVON RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Persons/Concepts	1	- No development of political movements, or ethnic traditions, or religious beliefs. No outstanding individuals or groups.
Rare Finds	2	- River may contain artifact scatters or isolated finds, and has some potential for undiscovered archaeological sites.
Themes In Canadian History	1	- Not known to contain sites or structures representative of major themes in Canadian history.
Summary of Average Human Heritage Scores		
Historical Development	1	
Persons/Concepts	1	
Rare Finds	2	
Themes in Canadian History	1	
Total	5 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 6.3	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing/Kayaking	8	- Opportunity for canoeing/kayaking is fair. Trips of up to three days in length are possible. Potential campsites are dispersed at somewhat regular intervals. Occasional class II rapids sequences exist but steep shores and few emergency exit points limit canoeability to the more experienced canoeists. Portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	7	- Opportunity for fishing is good. Adequate populations of Atlantic salmon and brook trout exist for sport fishing along most of the river.

TABLE 4-12 - DUNGARVON RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Hunting	5	- Opportunity for hunting is very good to excellent. Adequate populations of both large and small game and waterfowl exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	8	- Opportunity for intensive recreation activities is good to very good. A variety of land-based activities and a few water-based activities may be carried out along the length of the river.
Human Heritage Appreciation	2	- Opportunity for human heritage appreciation is poor to non-existent. No sites of historical significance have been identified along this river.
Natural Values		
Natural Attractions	7	- Opportunity for appreciation of scenic beauty is moderate. Animal sightings are common and one rare plant species can be found, but landforms are typical and uninteresting.
Solitude/Backcountry	8	- Opportunity to experience solitude/backcountry is good to very good. Occasional hydro wires, litter and camps are in evidence, but contact with other people is low.
Physical Factors		
Water Flow	5	- Water flow is fair. River depth, speed and width is adequate during May, June, and October of most years.
Navigability	8	- Navigability is good to very good. Occasional obstructions in the form of rocks and sandbars exist but do not significantly hinder passage.
Access	7	- Access to river is fair to good. Points of access for small crafts are frequent, but few or no access points exist for larger crafts.

TABLE 4-12 - DUNGARVON RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Water Quality	10	- Water quality is good. Appearance with respect to colour, odour, aquatic vegetation, and presence of solid waste along the river is acceptable for both land and water based activities.
Shoreline	7	- Shoreline quality is good for most recreational purposes. Terrain is usually suitable for parking, beaches, camping, and trails. Drainage is good; vegetation is dense to light; slope is steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of potential conflict between groups.

Summary of Average Recreational Value Scores

Capabilities	6.6
Impacts/Sensitivities	9
Total	15.6 x (Score Index of 2.5) = 39.0

TABLE 4-13 - EEL RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the Chaleur Uplands and the New Brunswick Highlands.
Bedrock	3	- Representation of one geologic era, three periods; Hortin formation.
Palaeontology	0	- No fossils identified.
Surficial Geology		
Development	3	- Representation of two stages of surficial development; organic and morainal sediments.
Features	5	- Esker, kame or isolated glaciofluvial deposit, meltwater channel.
Ongoing Processes		
Hydrology	6	- Small drainage area, relatively large proportion of drainage area as lakes/wetlands.
Water Quality	1	- Insufficient data for assessment.
Morphology	9	- Representation of irregular channels and irregular meanders; approximately 15 rapids and 11 islands, 2 waterfalls.
Vegetation		
Features	7	- Representation of Saint John River ecoregion; organic sediments; moderate extent of wetlands.
Alteration	4	- River environment heavily altered by man; settlement, forestry, transportation routes.

TABLE 4-13 - EEL RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	9	- Approximately 20 species of fish; excellent marshes for waterfowl breeding below First Eel Lake; significant hooded merganser and ring-necked duck habitat; bald eagle breeding area on lower stretch.
Natural Phenomena	7	- Waterfalls (approximately 4 m); excellent seasonal concentrations of waterfowl; geological formation.
Natural Beauty		
Features	9	- Varied channel patterns; varied vegetation patterns; superior viewing opportunities; waterfall, several rapids and islands; several natural phenomena.
Alteration	4	- River environment heavily altered by man; settlement, forestry, transportation routes.
Biota		
Rare/Endangered	9	- Endangered animal (bald eagle breeding area). Plants considered rare (*Carex cephaloidea*, *Carex hirtifolia*, *Hystrix patula* var. *bigeloviana*, *Podostemum ceratophyllum*, *Waldsteinia fragarioides*, *Hackelia deflexa* var. *americana*).
Species Concentrations	5	- Spring-summer run of lamprey; fall run of Atlantic salmon (small, predominantly grilse); concentrations of hooded merganser, ring-necked duck, and other breeding waterfowl.

Summary of Average Natural Heritage Scores

Geological Development	3.5
Ongoing Processes	6.8
Natural Phenomena	7
Natural Beauty	6.5
Biota	7
Total	30.8 x (Score Index of 1.0) = 30.8

TABLE 4-13 - EEL RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
HUMAN HERITAGE VALUES		
Historical Development		
Native People	6	- Archaeological sites of unknown antiquity. Prehistorically one of the most important canoe routes in the province. Good potential for undiscovered archaeological sites.
Settlement Patterns	2	- River is associated with settlement by Loyalists.
Transportation	3	- Important in the historic period for transportation between New Brunswick and the Northeast United States.
Persons/Concepts	4	- Part of the Micmac-Maliseet Trail. This route used to bring captive John Gyles, to Meductic from Pemmaquid in the 1680's.
Rare Finds	5	- Has artifact collections that can be documented to location, archaeological features, sites, isolated finds and archaeological potential.
Themes in Canadian History	2	- In the area there are several pre-1900 structures.
Summary of Average Human Heritage Scores		
Historical Development	3.7	
Persons/Concepts	4	
Rare Finds	5	
Themes in Canadian History	2	
Total	14.7 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 16.5	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing/Kayaking	4	- Opportunity for canoeing/kayaking is fair to good. Trips usually 1 or 2 days length, campsites are somewhat regular. Existing

TABLE 4-13 - EEL RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
		portages are in poor to good condition. Rapids challenge those of intermediate or better skill level.
Sport Fishing	9	- Opportunity for fishing is good to very good. Adequate populations of brook trout, smallmouth bass and other species exist for sport fishing. Potential is particularly good for warm water species.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of both large and small game exist for hunting. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreation activities is fair. Several different land-based activities and some water-based activities may be carried out along most of the river.
Human Heritage Appreciation	5	- Opportunity for human heritage appreciation is moderate. Several sites exist which are part of pre-historic and historic Micmac-Maliseet transport routes. Also unmarked archaeological sites and pre-1900 structures exist.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are unique and varied. Unique species of flora and fauna can be found in the area. Animal sightings (especially of many species of waterfowl) are common.
Solitude/Backcountry	7	- Opportunity to experience solitude/backcountry is good. Roads, power lines, and noise are present but unobtrusive. Structures are rural in nature, and contact with other people is varied but usually medium.

TABLE 4-13 - EEL RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Physical Factors		
Water Flow	7	- Water flow is good. River depth, speed and width are adequate during some parts of every year.
Navigability	6	- Navigability is fair to good. Rocks, waterfalls, rapids and sandbars may inhibit passage, especially at times of particularly low or high water flow.
Access	3	- Access to river is poor. Only occasional access points exist for smaller crafts, and none for large crafts.
Water Quality	10	- Water quality is very good. Appearance with respect to colour, odour, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both land- and water-based activities.
Shoreline	5	- Shoreline quality is adequate for few recreational purposes. Terrain is not suitable for beaches, trails, or parking. Drainage is good; vegetation is dense bush, brush and grass; and slope varies from steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	7	- Limited potential exists for physical/ecological impacts as a result of recreational use. Potential areas of impact include vegetation loss, compaction, and wildlife impacts.
Social/Psychological Impacts	7	- Likelihood exists for negative social/psychological impacts. Space on the river corridor is usually adequate but conflicts may occur between canoeists and anglers, and litter may increase as recreational use increases.

TABLE 4-13 - EEL RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Recreational Value Scores		
Capabilities	6.5	
Impacts Sensitivities	7	
Total	13.5 x (Score Index of 2.5) = 33.8	

TABLE 4-14 - KEDGWICK RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the Notre Dame Mountains and the Chaleur Uplands.
Bedrock Geology	3	- Representation of one geologic era, three periods; Matapedia rock group.
Palaeontology	5	- Corals, crinoids, brachiopods.
Surficial Geology		
Development	3	- Representation of three stages of surficial development; alluvial, morainal, and pre-quaternary sediments.
Features	2.5	- Meltwater channel.
Ongoing Processes		
Hydrology	6	- Good representation of natural hydrologic characteristics of rivers in drainage region; good representation of variable hydrologic conditions.
Water Quality	2.7	- Calcium bicarbonate type; moderately hard water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	7	- Representation of irregular channels; terraces/floodplains; approximately 2 rapids, 5 islands, and 1 bar.
Vegetation		
Features	2	- Representation of Restigouche, Maritime Uplands, and New Brunswick Highlands ecoregions.
Alteration	9	- River environment altered little by man; settlement, forestry.

TABLE 4-14 - KEDGWICK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	9	- Approximately 12 species of fish; several major deer wintering areas at head of river of significance; Canada lynx habitat.
Natural Phenomena	8	- Terraces to river gravel banks; Devils Elbow rapids; waterfall at mouth of Falls Brook (approximately 10 m); seasonal concentrations of white-tailed deer and several fish; fossils present.
Natural Beauty		
Features	9	Variety of vegetation patterns; variety of topography; rapids and islands; several natural phenomena; highly distinguishable landforms/landscape.
Alteration	9	- River environment altered little by man; settlement, forestry.
Biota		
Rare/Endangered	9	- Endangered animal (Canada lynx).
Species Concentrations	2	- Spring-summer run of Atlantic salmon (large run; predominantly large salmon), brook trout, lamprey; fall run of Atlantic salmon (small run; predominantly large salmon); concentrations of wintering white-tailed deer.
Summary of Average Natural Heritage Scores		
Geological Development	4.5	
Ongoing Processes	6.5	
Natural Phenomena	8	
Natural Beauty	9	
Biota	5.5	
Total	33.5 x (Score Index of 1.0) = 33.5	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	1	- No known sites or collections.

TABLE 4-14 - KEDGWICK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Settlement Patterns	1	- Settlements not known to have grown for military or agricultural reasons, or settlement of a group.
Transportation	1	- Not important for transportation within New Brunswick, no major routes.
Persons/Concepts	1	- Data gap.
Rare Finds	1	- Possible isolated finds.
Themes in Canadian History	1	- No known examples.
Summary of Average Human Heritage Scores		
Historical Development	1	
Persons/Concepts	1	
Rare Finds	1	
Themes in Canadian History	1	
Total	4 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 5	
RECREATIONAL VALUES		
Capabilities Range of Appropriate Activities		
Canoeing/Kayaking	14	- Opportunity for canoeing/kayaking is good. Overnight trips with a variety of rapids sequences are possible. Campsites are evenly dispersed and short portages are available where necessary. Includes adjustment factor of 2.0.
Sport Fishing	9	- Opportunity for fishing is very good. Atlantic salmon is stocked and an adequate population for sport fishing of other species exists along much of the river.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game exist along the length of the river. Includes adjustment factor of 0.5.

TABLE 4-14 - KEDGWICK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Intensive Recreation	8	- Opportunity for intensive recreation activities is very good. Potential exists for many different activities to be carried out along most of the river.
Human Heritage Appreciation	2	- Opportunity for human heritage appreciation is poor. No active or marked sites of historical or cultural significance are present, although some pre-1900 structures exist.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are varied and attractive vistas and waterfalls can be found. Sightings of lynx and cougar are possible.
Solitude/Backcountry	7	- Opportunity to experience solitude/backcountry is good. Litter, roads, power lines, noise, etc. are limited; some structures and industry are present. Contact with other people is likely.
Physical Factors		
Water Flow	10	- Water flow is excellent. River depth, speed and width is adequate during a majority of every year.
Navigability	9	- Navigability is very good to excellent. Obstructions of any nature are rare.
Access	5	- Access to river is fair, but only for smaller crafts. No access points have been identified for larger crafts.
Water Quality	10	- Water quality is very good. Appearance with respect to colour, odour, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both water- and land-based activities.

TABLE 4-14 - KEDGWICK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Shoreline	7	- Shoreline quality is good for some recreational purposes. Terrain is suitable for parking, camping and trails. Drainage is excellent, vegetation is dense, and slope is steep to flat.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Physical/ecological impacts as a result of recreational use are unlikely.
Social/Psychological Impacts	5	- Likelihood of negative social/psychological impacts is fair. Conflicts are common between anglers and canoeists.

Summary of Average Recreational Value Scores

Capabilities	7.5
Impact/Sensitivities	7
Total	14.5 x (Score Index of 2.5) = 36.3

TABLE 4-15 - KENNEBECASIS RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the New Brunswick Highlands.
Bedrock Geology	7	- Representation of two geologic eras, two periods; Saint John rock group, Kennebecasis, Ashburn and Albert formations.
Palaeontology	7.5	- Rare fish fossils (Palaeoniscids, species alberti unique to N.B.), trilobites, brachiopods.
Surficial Geology		
Development	7	- Representation of five stages of surficial development; alluvial, morainal, glaciofluvial, morainal/colluvial, and pre-quaternary sediments.
Features	7.5	- Fluted bedrock and drumlinoid ridges, kame or isolated glaciofluvial deposit, meltwater channel, delta, sink hole.
Ongoing Processes		
Hydrology	7	- Very good representation of natural hydrologic characteristics of large rivers in the drainage region; approximately 10% of length is tidal.
Water Quality	10	- Calcium bicarbonate to calcium bicarbonate/sodium chloride type; soft water; large variation of natural water quality due to influence of salt deposits. Includes adjustment factor of 1.0.
Morphology	8	- Representation of irregular channels, irregular and tortuous meanders; terraces/floodplains; approximately 47 oxbow lakes/associated features, 71 islands, 6 bars.

TABLE 4-15 - KENNEBECASIS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Vegetation		
Features	8	- Representation of Magaguadavic ecoregion; moderate extent of wetlands unique ecosystems (Picadilly Mountain hardwood ridge, Hampton deciduous forest talus slope, Hampton freshwater marsh).
Alteration	1	- River environment severely altered by man; settlement, agriculture, industry.
Wildlife	10	- Approximately 20 species of fish; important as waterfowl migration, breeding, staging areas, especially the lower reaches, Darlings Lake, other marshes, for ring-necked ducks, greater scaup; fall staging of teal; staging area in spring of Canada geese below Bloomfield.
Natural Phenomena	9	- Steeply dipping layers of early Carboniferous sandstone and mudstone deposited by ancient river system, well developed ripple marks (Norton); many oxbow lakes/features; excellent seasonal concentrations of waterfowl, shorebirds, white-tailed deer, and many fish species; fossils present; several geological formations.
Natural Beauty		
Features	9	- Variety of channel patterns; varied vegetation patterns; many islands and varied surficial features; superior/frequent viewing opportunity; many natural phenomena.
Alteration	1	- River environment severely altered by man; settlement, agriculture, industry.
Biota		
Rare/Endangered	6	- Plants considered rare (Draba glabella, Saxifraga paniculata, Carex amphibola var. turgida, Carex saxatilis var. miliaris, Cryptotaenia canadensis); Canadian rare species (shortnose sturgeon).

TABLE 4-15 - KENNEBECASIS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Species Concentrations	10	- Spring-summer runs of lamprey, brook trout, rainbow smelt, alewife, blueback herring, striped bass, American shad; summer-fall run of Atlantic salmon (predominantly grilse); concentrations of ring-necked duck, greater scaup, teal, Canada geese, and other waterfowl; concentrations of wintering white-tailed deer (about 700 from Portageville to Sussex); concentrations of furbearers (muskrat).
Summary of Average Natural Heritage Scores		
Geological Development	6.2	
Ongoing Processes	7.8	
Natural Phenomena	9	
Natural Beauty	5	
Biota	8	
Total	36 x (Score Index of 1.0) = 36	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	4	- The Kennebecasis scored low in this component since little archaeological research has been done on the river and therefore little is recorded about the prehistory of Native peoples. From the historical record it is known that the river does contain prehistoric sites (Hampton, Apohaqui) and was utilized by Native peoples, for among other things a canoe route. It should also be noted that there was a burial site and village at Apohaqui and a second burial at Hampton.
Settlement Patterns	6	- There were trading locations at Hampton and Kingston, area settled by the following groups; Acadian, Irish, Loyalist, Scots.

TABLE 4-15 - KENNEBECASIS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
		This river had several businesses that contributed to the development of settlements; Eddy Match factory-Hampton, tanneries, gristmills, sawmills.
Transportation	5	- Played an important role in the transport of goods and people within province (European and North American Railway), and had several shipbuilding localities such as Moss Glen and Clifton Royal. Some settlements were situated so as to benefit from transport of goods and people within the province (European and Northern American Railway). Some settlements were situated so as to benefit from transportation routes (Rothesay, Hampton, Sussex, Norton) by supplying housing, the machinery or individuals travelling or working on the various forms of transportation.
Persons / Concepts	4	- Outstanding individuals include the Paris crew-skulling, Wallace Turnbull-builder of Canada's first wind tunnel at Rothesay, Charlie Humphrey Bonnycastle-rowing, Lesley Armstrong, John Richard Quigg-speedskating).
Rare Finds	6	- Contains prehistoric and historic sites such as Stoneycraft, Hampton Gaol, native burial Hampton.
Themes in Canadian History	5	- Shipbuilding sites, site of the European and North American Railway-Rothesay, Trinity Church-Kingston, the Hampton Gaol, Stoneycraft-Quispamsis).

TABLE 4-15 - KENNEBECASIS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Human Heritage Scores		
Historical Development	5	
Persons/Concepts	4	
Rare Finds	6	
Themes in Canadian History	5	
	20 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 22.5	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing/Kayaking	6	- Opportunity for canoeing/kayaking is fair. Overnight trips are not usually possible; water is slow moving with no rapids sequences; portaging is not necessary; potential for campsites exists at somewhat regular intervals. Includes adjustment factor of 2.0.
Sport Fishing	10	- Opportunity for fishing is very good to excellent. Atlantic salmon is stocked and an adequate population of several other species exists for sport fishing along much of the river.
Hunting	3.5	- Opportunity for hunting is moderate to good. Adequate populations of small game and deer exist along much of the river. Opportunities also exist for hunting waterfowl in some areas. Includes adjustment factor of 0.5.
Intensive Recreation	9	- Opportunity for intensive recreation activities is very good to excellent. Many different land- and water-based activities may be carried out along the length of the river.
Human Heritage Appreciation	9	- Opportunity for human heritage appreciation is very good. Museums, covered bridges, historic sites and archaeological sites occur.

TABLE 4-15 - KENNEBECASIS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Values		
Natural Attractions	9	Opportunity for appreciation of scenic beauty is very good. Landforms are varied and many viewing opportunities exist. Several rare plant species can be found, and some areas are important for waterfowl breeding, staging, and migration.
Solitude/Backcountry	5	- Opportunity to experience solitude/backcountry is moderate. Litter, roads, power lines, noise, etc. exist, and structures and industry are largely rural in nature.
Physical Factors		
Water Flow	10	- Flow of water is excellent. River depth, speed and width is adequate during May to December of every year.
Navigability	9	- Navigability is very good to excellent. Obstructions are infrequent, and rocks are charted and buoyed on much of the river.
Access	7	- Access to river is good. Occasional access points for large crafts and frequent access points for smaller crafts are dispersed along the river.
Water Quality	8	- Water quality is very good. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable, although algae blooms occur occasionally in late summer.
Shoreline	6	- Shoreline quality is acceptable for some recreational purposes. Terrain is suitable for parking and trails. Drainage is good, vegetation is light, and slope is steep to gentle.

TABLE 4-15 - KENNEBECASIS RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between groups.

Summary of Average Recreational Value Scores

Capabilities	7.3
Impact/Sensitivities	9
Total	16.3 x (Score Index of 2.5) = 40.8

TABLE 4-16 - KOUCHIBOUGUAC RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the Maritime Plain.
Bedrock Geology	1	- Representation of one geologic era, one period.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	3	- Representation of two stages of surficial development; marine and morainal sediments.
Features	2.5	- Eskers, meltwater channel.
Ongoing Processes		
Hydrology	6	- Good representation of natural hydrologic characteristics of rivers in drainage region, relatively large proportion of drainage area as lakes/wetlands; approximately 20% of length is tidal.
Water Quality	4.5	- Calcium bicarbonate to sodium chloride type; very soft to very hard water; large variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	1	- Representation of irregular channels; approximately 2 islands.
Vegetation		
Features	6	- Representation of Maritime Lowlands ecoregion; moderate extent of wetlands.
Alteration	7	- River environment altered somewhat by man; settlement, forestry.
Wildlife	9	- Approximately 10 species of fish; lower river important for waterfowl; significant brant concentrations in spring; osprey nesting in estuary.

TABLE 4-16 - KOUCHIBOUGUAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Phenomena	7	- Barrier island system at mouth of river; extensive tidal influence; seasonal concentrations of waterfowl and several fish species; fossils present.
Natural Beauty		
Features	9	- Variety of land-water relations; varied vegetation patterns; several natural phenomena.
Alteration	7	- River environment altered somewhat by man; settlement, forestry.
Biota		
Rare/Endangered	1	- None.
Species Concentrations	7	- Spring-summer runs of brook trout, lamprey, rainbow smelt, striped bass; fall run of Atlantic salmon (small run); concentrations of waterfowl, significant concentrations of brant in spring.
Summary of Average Natural Heritage Scores		
Geological Development	2.3	
Ongoing Processes	5.5	
Natural Phenomena	7	
Natural Beauty	8	
Biota	4	
Total	26.8 x (Score Index of 1.0) = 26.8	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	4	- Contains prehistoric sites and was utilized by native groups.
Settlement Patterns	1	- No known military or trade establishments. Some resource utilization.
Transportation	1	- Not important for transportation within New Brunswick, no major routes.

TABLE 4-16 - KOUCHIBOUGUAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Persons/Concepts	1	- Data gap.
Rare Finds	3	- The river has prehistoric sites, artifact collections that can be documented to location and features that exhibit archaeological context.
Themes in Canadian History	1	- No known examples.
Summary of Average Human Heritage Scores		
Historical Development	2	
Persons / Concepts	1	
Rare Finds	3	
Themes in Canadian History	1	
Total	7 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 8.8	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	8	- Opportunity for canoeing/kayaking is good. Overnight trips of up to five days are possible; campsites are dispersed at somewhat regular intervals; water may be swift, but few or no rapids sequences; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	3	- Opportunity for fishing is poor. Adequate populations of few or no species exist for sport fishing along most of the river.
Hunting	2.5	- Opportunity for hunting is fair. Adequate populations of large and small game, and waterfowl exist for hunting, but hunting is not permitted within the National Park. Includes adjustment factor of 0.5.

TABLE 4-16 - KOUCHIBOUGUAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. Several land-based activities may be carried out; water-based activities are concentrated in the tidal estuary.
Human Heritage Appreciation	3	- Opportunity for human heritage appreciation is fair or poor. A few invisible sites exist along the river and limited interpretation takes place in the National Park.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. The tidal estuary is important for waterfowl and birds; sightings of deer, moose and waterfowl may occur; fall foliage is pretty in some areas; unique/attractive vistas can be found.
Solitude/Backcountry	7	- Opportunity to experience solitude/backcountry is good. Occasional litter, and roads can be seen; but potential for contact with other people is usually high.
Physical Factors		
Water Flow	5	- Water flow is fair. River depth, speed and width is adequate during three months of every year.
Navigability	5	- Navigability is fair. Occasional logs and beaver dams obstruct passage, especially during times of low flow. Rocks, weirs, and sandbars are rare.
Access	7	- Access to river is fair to good. Points of access for small crafts occur frequently, but access for large crafts is rare.
Water Quality	10	- Water quality is very good. Appearance with respect to colour, odour, aquatic vegetation, and presence of solid waste is acceptable for both land- and water-based activities.

TABLE 4-16 - KOUCHIBOUGUAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Shoreline	6	- Shoreline quality is adequate for most recreational purposes in some areas only. Terrain is sometimes suitable in some areas for parking, beaches, camping, and trails. Drainage is good, vegetation is dense, and slope is steep.
Impacts/Sensitivities		
Physical/Ecological Impacts	6	- Potential exists for physical/ecological impacts as a result of recreational use. Compaction, water quality impacts, erosion and vegetation loss may occur.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between recreation groups.

Summary of Average Recreational Value Scores

Capabilities	5.8
Impacts/Sensitivities	7.5
Total	13.3 x (Score Index of 2.0) = 33.3

TABLE 4-17 - LITTLE SOUTHWEST MIRAMICHI RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the New Brunswick Highlands and the Maritime Plain.
Bedrock Geology	6	- Representation of one geologic era, four periods; Kingsclear, Tetagouche, and Matapedia rock groups.
Palaeontology	5	- Graptolites, brachiopods.
Surficial Geology		
Development	4	- Representation of three stages of surficial development; alluvial, morainal, glaciofluvial sediments.
Features	7.5	- Fluted bedrock and drumlinoid ridges, moraine ridges, eskers, kames or isolated glaciofluvial deposits, meltwater channels.
Ongoing Processes		
Hydrology	7	- Very good representation of natural hydrologic characteristics of large rivers in drainage region, moderate proportion of drainage area as lakes/wetlands; approximately 3% of length is tidal.
Water Quality	3.6	- Calcium bicarbonate type; very soft water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	9	- Representation of irregular channels and irregular meanders; terraces/floodplains; approximately 1 waterfall, 16 rapids, 76 islands, and 38 bars.
Vegetation		
Features	6	- Representation of Restigouche, New Brunswick Highlands, Maritime Uplands, and Maritime Lowlands ecoregions; some wetlands.

TABLE 4-17 - LITTLE SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	7	- River environment altered somewhat by man; settlement, forestry.
Wildlife	7	- Approximately 15 species of fish; significant deer wintering area about 2 miles above mouth, extending for about 16 km, 600-800 deer.
Natural Phenomena	9	- Crosses fault above Sillikers; deeply cut valley flowing across many formations; cascading waterfall through boulder trains below confluence of West Branch (approximately 8 m); canyon-like to steeply sloped valley, deep cuts (approximately 75 m); major falls and rapids, narrow gorges with granite ledges; high terraces; seasonal concentrations of white-tailed deer and several fish species; fossils present.
Natural Beauty		
Features	9	- Variety of topography, channel patterns; highly varied vegetation patterns and surficial features; many natural phenomena; one waterfall, many islands and rapids.
Alteration	7	- River environment altered somewhat by man; settlement, forestry.
Biota		
Rare/Endangered	1	- None.
Species Concentrations	4	- Spring-summer runs of Atlantic salmon (large run; predominantly grilse), brook trout, lamprey, rainbow smelt, alewife, blueback herring; fall run of Atlantic salmon (small run; predominantly grilse); concentrations of wintering white-tailed deer (600-800).

TABLE 4-17 - LITTLE SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	6	
Ongoing Processes	7	
Natural Phenomena	9	
Natural Beauty	8	
Biota	2.5	
Total	32.5 x (Score Index of 1.0) = 32.5	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	9	- No known paleo period sites or artifacts. High score is primarily based on the presence of the Augustine Burial Mound and the Oxbow Site. Otherwise rich in smaller prehistoric sites, has representatives from all other periods. River used for resource procurement, has the Augustine Mound representing religious concepts, mortuary practises, an important location and exceptional lithic and organic artifacts. Contains the present Native settlement of Red Bank, as well as the Oxbow.
Settlement Patterns	3	- Settled for several reasons, the availability of natural resources (salmon, sturgeon, smelt, lumber, masts, and later pulp wood, and for its agricultural potential). Not noted for trading sites, military reasons, or the growth of a large community. Settled by numbers of Irish, Scots and some Loyalists.
Transportation	2	- Utilized primarily for local transport of individuals and goods. In the historic period did not play a significant role in connecting the various river systems with the Miramichi.

TABLE 4-17 - LITTLE SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Persons/Concepts	3	- In the mid 1700's, when Davidson moved to Maugerville, three English families stayed in the Red Bank - Sunny Corner area, the former covered bridge at this same location was the third longest in the world, Miramichi fire of 1825.
Rare Finds	10	- Contains Augustine Burial Mound, and the Oxbow an undisturbed site in an authentic environment. In addition, many other sites in the area.
Themes in Canadian History	7	- Although the river environment includes the Augustine Mound, the Oxbow, and the former Red Bank bridge, there are few other sites or structures that add the substance necessary to achieve a perfect score for a Canadian theme.
Summary of Average Human Heritage Scores		
Historical Development	4.7	
Persons/Concepts	3	
Rare Finds	10	
Themes in Canadian History	7	
Total	24.7 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 30.9	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	4	- Opportunity for canoeing/kayaking is moderate. Trips of up to three days are possible. Potential campsites are dispersed at somewhat regular intervals; class III or higher rapids sequences limit canoeability in some areas for all but the most advanced canoeists. Several long portages are necessary.

TABLE 4-17 - LITTLE SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Sport Fishing	9	- Opportunity for fishing is good. Adequate populations of Atlantic salmon and brook trout exist for sport fishing along the length of the river.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of both large and small game exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. A variety of land- and water-based activities may be carried out along the length of the river.
Human Heritage Appreciation	7	- Opportunity for human heritage appreciation is moderate. Visible and invisible sites including two National Historic Sites, pre-1900 structures, and prehistoric archaeological sites can be found along the river.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is good to excellent. Deep valleys and gorges, attractive vistas, fall colors, and scenic woodland areas all contribute to the beauty of the area. Sightings of deer and coyote are common.
Solitude/Backcountry	8	- Opportunity to experience solitude/backcountry is good to very good. Structures, industry, noise, and pollution are rarely present; roads and hydro wires are visible only at the lower end of the river. Contact with other people is usually low but varies daily.
Physical Factors		
Water Flow	7	- Water flow is fair. River depth, speed and width is adequate during the spring and fall of most years.

TABLE 4-17 - LITTLE SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Navigability	6	- Navigability is fair. Frequent rocks and some ledges limit navigability for all but experienced canoeists.
Access	3	- Access to river is poor. Points of access are rare for small crafts and non-existent for larger crafts.
Water Quality	10	- Water quality is good. Appearance with respect to color, odor, aquatic vegetation, and presence of solid waste along the river is acceptable for both land- and water-based activities.
Shoreline	8	- Shoreline quality is good for most recreational purposes. Terrain is suitable for parking, beaches, camping, and trails. Drainage is good; vegetation is dense to light; and slope is steep.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Likelihood of physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	5	- Likelihood of negative social/psychological impacts is moderate. Space on the river corridor is adequate, but there is some likelihood of potential conflict between canoeists and anglers.

Summary of Average Recreational Value Scores

Capabilities	6.9
Impacts/Sensitivities	7
Total	13.9 x (Score Index of 2.5) = 34.8

TABLE 4-18 - MAGAGUADAVIC RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the New Brunswick Highlands.
Bedrock Geology	3	- Representation of one geologic era, three periods.
Palaeontology	5	- Crinoids, brachiopods.
Surficial Geology		
Development	5	- Representation of four stages of surficial development; alluvial, marine, glaciofluvial, and pre-quaternary sediments.
Features	5	- Moraine ridges, eskers, meltwater channels.
Ongoing Processes		
Hydrology	2	- Relatively large proportion of drainage area as lakes/wetlands; approximately 15% of length is tidal; regulated flow.
Water Quality	2.7	- Calcium bicarbonate - sulphate to calcium bicarbonate/sodium chloride-sulphate type; very soft water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	10	- Representation of irregular channels, irregular and tortuous meanders; terraces/floodplains; approximately 4 falls, 67 islands, 2 oxbow lakes/associated features, and many rapids.
Vegetation		
Features	5	- Representation of Magaguadavic and Maritime Uplands ecoregions; some wetlands.
Alteration	3	- River environment heavily altered by man; settlement, forestry, industry.

TABLE 4-18 - MAGAGUADAVIC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	8	- Approximately 15 species of fish; two major deer wintering areas, one between MacDougall Lake and river, the other along the river from Kedron Brook; bald eagle breeding areas near and at mouth of river.
Natural Phenomena	10	- 12 km late-glacial outwash deposit with three terrace levels, remnants of subglacial esker system (Brockway); river runs across and along St. George Fault; crosses fault at Thomaston Corner; St. George granite batholith; several waterfalls (Flume, Little, McDougall, Second); oxbow lakes/features; seasonal concentrations of white-tailed deer and several fish species; fossils present.
Natural Beauty		
Features	10	- Highly varied channel patterns; varied vegetation patterns and surficial features; four waterfalls, many rapids, many islands, many natural phenomena.
Alteration	3	- River environment heavily altered by man; settlement, forestry, industry.
Biota		
Rare/Endangered	9	- Endangered animal (bald eagle breeding area).
Species Concentrations	2	- Summer run of alewife; summer-fall run of Atlantic salmon (predominantly large salmon); concentrations of wintering white-tailed deer.

Summary of Average Natural Heritage Scores

Geological Development	4
Ongoing Processes	6.1
Natural Phenomena	10
Natural Beauty	6.5
Biota	5.5
Total	32.1 x (Score Index of 1.0) = 32.1

TABLE 4-18 - MAGAGUADAVIC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
HUMAN HERITAGE VALUES		
Historical Development		
Native People	5	- Contains prehistoric sites, was part of a link to the L'Etang, the Oromocto, and the St. Croix. There is potential for undiscovered archaeological sites.
Settlement Patterns	3	- Settled by the Royal Fencibles. Natural resources were important in the decision to settle.
Transportation	2	- Localized and coastal transportation played a role in the river's development.
Persons/Concepts	1	- Not associated with political movements, ethnic tradition, no known outstanding individuals.
Rare Finds	3	- Collections can be documented as to location. As well there are features and archaeological sites.
Themes in Canadian History	2	- Sites of various mills along the river.

Summary of Average Human Heritage Scores

Historical Development	3.3
Persons / Concepts	1
Rare Finds	3
Themes in Canadian History	2
Total	9.3 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 11.6

TABLE 4-18 - MAGAGUADAVIC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	10	- Opportunity for canoeing/kayaking is fair. Trips of two to five days in length are possible. Campsite dispersal is irregular; some rapids sequences are appropriate for advanced canoeists only; a few short to medium length portages are necessary. Includes adjustment factor of 2.0.
Sport Fishing	9	- Opportunity for fishing is very good. Adequate populations of brook trout, smallmouth bass and other species exist, and an adequate population of Atlantic salmon exists for fishing in September only.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game and waterfowl exist for hunting. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. Several land-based and a few water-based activities may be carried out along most of the river.
Human Heritage Appreciation	4	- Opportunity for human heritage appreciation is fair. A few visible and invisible sites of significance exist along the river corridor.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are varied and striking, and unique/attractive vistas are present; unique/rare animal species can be found and animal sightings are common; fall colors are beautiful.

TABLE 4-18 - MAGAGUADAVIC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Solitude/Backcountry	7	- Opportunity to experience solitude/backcountry is good. Litter, structures, power lines, roads, and noise, may be all present. Contact with other people is usually low.
Physical Factors		
Water Flow	5	- Water flow is fair. River depth, speed and width is adequate from April to October, but not dependable from year to year.
Navigability	5	- Navigability is fair. Rocks and sandbars are common but not impassable.
Access	5	- Access to river is fair. Frequent access points exist for small crafts, but few or no points exist for larger crafts.
Water Quality	10	- Water quality is very good. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both land- and water-based activities.
Shoreline	7	- Shoreline quality is adequate for some recreational purposes. Although few areas have been developed, terrain is potentially suitable for parking camping, beaches, and trails; drainage is good; vegetation varies from dense to light; slope varies from steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between groups.

TABLE 4-18 - MAGAGUADAVIC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Recreational Value Scores		
Capabilities	6.6	
Impacts/Sensitivities	9	
Total	15.6 x (Score Index of 2.5) = 39.0	

TABLE 4-19 - NASHWAAK RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the New Brunswick Highlands and the Maritime Plain.
Bedrock Geology	9	- Representation of two geologic eras, 6 periods; Nashwaak granite.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	4	- Representation of three stages of surficial development; alluvial, lacustrine and marine, glaciofluvial, and morainal sediments.
Features	5	- Moraine ridges, kames or isolated glaciofluvial deposits, meltwater channels, delta.
Ongoing Processes		
Hydrology	7	- Very good representation of natural hydrologic characteristics of large rivers in the drainage region; approximately 5% of length is tidal.
Water Quality	8	- Calcium bicarbonate/sodium chloride-sulphate type, due to sedimentary geology; very soft to soft water; some variation of natural water quality. Includes adjustment factor of 1.0.
Morphology	6	- Representation of irregular channels; terraces/floodplains; approximately 30 rapids and 84 islands.
Vegetation		
Features	8	- Representation of Magaguadavic, Maritime Uplands and Maritime Lowlands ecoregions; some wetlands; unique ecosystems (Narrows Mountain sugar maple-beech stand, Long Lake mixed wood stand).

TABLE 4-19 - NASHWAAK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	4	- River environment heavily altered by man; settlement, agriculture, forestry, industry.
Wildlife	7	- Approximately 20 species of fish; a few significant deer wintering areas along river.
Natural Phenomena	7	- Large subaqueous esker fan (Durham Bridge); river crosses fault at Nashwaak village, and two locations on upper reaches; stream piracy (captured headwaters of Taxis); seasonal concentrations of white-tailed deer and several fish species; fossils present.
Natural Beauty		
Features	8	- Variety of topography; rapids and islands; highly varied vegetation patterns and surficial features; frequent viewing opportunities; several natural phenomena.
Alteration	4	- River environment heavily altered by man; settlement, agriculture, forestry, industry.
Biota		
Rare/Endangered	1	- None.
Species Concentrations	4	- Spring-summer runs of brook trout, alewife, blueback herring, Atlantic salmon (predominantly grilse), lamprey, rainbow smelt; fall run of Atlantic salmon (predominantly large salmon); concentrations of wintering white-tailed deer.

Summary of Average Natural Heritage Scores

Geological Development	5.8
Ongoing Processes	6.6
Natural Phenomena	7
Natural Beauty	6
Biota	2.5
Total	27.9 x (Score Index of 1.0) = 27.9

TABLE 4-19 - NASHWAAK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
HUMAN HERITAGE VALUES		
Historical Development		
Native People	6	- Contains archaic, ceramic, contact and historic period sites. Utilized for resource procurement, as a canoe route, and a means of travel between the Saint John and Miramichi systems. Historical documentation suggests potential for undiscovered archaeological sites.
Settlement Patterns	10	- The river had important trade and military establishments (Fort Nashwaak), floodplain preferred agricultural location. Marysville (cotton mill) and Stanley (lumber industry) are examples of commercial centres. Settled by French, English, Acadian, Irish, Loyalist and military regiments. Fort Nashwaak was Villebon's base of military operations. Fort attacked during the 17th century. Natural resources utilized (masts, lumber, salmon).
Transportation	4	- Used for transporting lumber, for access between the Saint John and Miramichi, and for local transport. Settlement at the mouth of the river was in a prime spot with respect to the junction of two routes. During the 1800's several hotels and taverns along the river catered to travellers.
Persons/Concepts	5	- The Stanley Fair represents a 138-year tradition. Boss Gibson built his wealth around the timber and lumber trade, saw mills, railroad, stores, hotels, brickyard, cotton mill, some 50 houses and a church. Villebon, had his base of operations at Fort Nashwaak.

TABLE 4-19 - NASHWAAK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Rare Finds	7	- Historical sites include Fort Nashwaak, and the Cotton Mill with associated structures. Also contains prehistoric and historic sites, archaeological features, and has potential for additional undiscovered archaeological sites.
Themes in Canadian History	5	- Fort Nashwaak, the Cotton Mill and sections of Marysville, the community of Stanley, the Loyalist and later Victorian structures represent themes in Canadian or New Brunswick history.
Summary of Average Human Heritage Scores		
Historical Development	6.7	
Persons/Concepts	5	
Rare Finds	7	
Themes in Canadian History	5	
Total	23.7 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 26.6	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	10	- Opportunity for canoeing/kayaking is fair. Trips of one to three days are possible; short portages are available where required, and considerable poling is necessary on some sections of the river; rapids on some sections challenge intermediate to advanced canoeists; potential for campsites exists at somewhat regular intervals. Includes adjustment factor of 2.0.
Sport Fishing	10	- Opportunity for fishing is very good to excellent. Atlantic salmon is stocked and an adequate population of several other species exists for sport fishing along much of the river.

TABLE 4-19 - NASHWAAK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations for hunting of both large and small game exist along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	9	- Opportunity for intensive recreation activities is very good. A wide range of different land- and water-based activities may be carried out along the length of the river.
Human Heritage Appreciation	7	- Opportunity for human heritage appreciation is good. Several marked sites of historical or cultural significance include Fort Nashwaak, Marysville Place and 42nd Highland Memorial Cemetery, some pre-1900 structures exist around the communities of Taymouth and Stanley, unmarked archaeological sites.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are varied and attractive vistas can be found. Sighting of deer, moose, and partridge are common and fall colours are beautiful in some areas.
Solitude/Backcountry	5	- Opportunity to experience solitude/backcountry is moderate. Litter, roads, power lines, noise, etc. are in evidence along some stretches of the river; structures and industry are rural in nature; contact with other people is likely, especially below Stanley.
Physical Factors		
Water Flow	7	- Water flow is fair to good. River depth, speed and width is adequate for navigation during the spring and fall of every year.
Navigability	6	- Navigability is fair. Rocks are frequently encountered, sandbars and other obstructions are occasional.

TABLE 4-19 - NASHWAAK RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Access	7	- Access to river is good, especially for smaller crafts. Access for larger crafts is limited to the mouth of the river.
Water Quality	10	- Water quality is very good. Appearance with respect to colour, odour, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both water- and land-based activities.
Shoreline	8	- Shoreline quality is good to very good for most recreational purposes. Terrain is suitable for parking, tenting, beaches and trails. Drainage is good, vegetation is light, and slope is steep to flat.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Physical/ecological impacts as a result of recreational use are unlikely.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between most groups.

Summary of Average Recreational Value Scores

Capabilities	7.4
Impacts/Sensitivities	9
Total	16.4 x (Score Index of 2.5) = 41.0

TABLE 4-20 - NEPISIGUIT RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the New Brunswick Highlands and the Maritime Plain.
Bedrock Geology	4	- Representation of one geologic era, three periods; Dalhousie and Tetagouche rock groups.
Palaeontology	5	- Brachiopods, graptolites.
Surficial Geology		
Development	8	- Representation of five stages of surficial development; alluvial, marine, lacustrine and marine, glaciofluvial, morainal, and pre-quaternary sediments.
Features	4	- Eskers, kame or isolated glaciofluvial deposit, meltwater channel, fluted bedrock and drumlinoid ridges.
Ongoing Processes		
Hydrology	2	- Very good representation of significant hydrologic features, approximately 3% of length is tidal; lakes/wetlands associated; regulated flow.
Water Quality	8	- Calcium bicarbonate to calcium bicarbonate - sulphate type; very soft to very hard water; large variation of natural water quality. Includes adjustment factor of 0.8.
Morphology	10	- Representation of straight and irregular channels; terraces/floodplains; approximately 4 waterfalls, 17 rapids, and 90 islands.
Vegetation		
Features	7	- Representation of Restigouche and New Brunswick Highlands ecoregions; some wetlands; unique ecosystems (Nepisiguit River cedar stand, Nepisiguit River black spruce stand).

TABLE 4-20 - NEPISIGUIT RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	6	- River environment altered little by man; settlement, industry, forestry.
Wildlife	9	- Approximately 10 species of fish; significant nesting area for a few harlequin ducks at Indian Falls, at least a dozen major concentrations of wintering deer.
Natural Phenomena	10	- Carboniferous redbeds on riverbank exhibit upward fining sequences (conglomerate grading into cross-bedded sandstone and shale overlies lower shale bed) (Bathurst); Pabineau Falls (formed of coarse-grained Devonian granite, prominent fractures injected by dykes up to 1 m wide); broad ancient valley; gravel terraces; isolated cliffs; several significant waterfalls; river cut into peneplain up to 100 m; excellent seasonal concentrations of white-tailed deer and many fish species; fossils present.
Natural Beauty		
Features	10	- Variety of topography, channel patterns, vegetation patterns, and surficial features; superior/frequent viewing opportunity; four waterfalls, rapids, and many islands; many natural phenomena.
Alteration	6	- River environment altered little by man; settlement, industry, forestry.
Biota		
Rare/Endangered	6	- Plants considered rare (Oryzopsis pungens, Dichanthelium xanthophysum, Utricularia minor.
Species Concentrations	4	- Spring-summer runs of Atlantic salmon (small run; predominantly grilse), alewife, rainbow smelt, American shad, brook trout; fall run of Atlantic salmon (large run; predominantly large salmon); concentrations of wintering white-tailed deer.

TABLE 4-20 - NEPISIGUIT RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	5.5	
Ongoing Processes	7.6	
Natural Phenomena	10	
Natural Beauty	8	
Biota	5	
Total	36.1 x (Score Index of 1.0) = 36.1	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	5	- Native utilization primarily for transportation inland to hunt, and for access to other river systems. Ganong indicates a Native settlement at Rough Waters. Known archaic period sites.
Settlement Patterns	4	- Military and trading establishments at "Nepisiguit" include Enaud's settlement at the mouth (ca.1686) which contained a grist mill. Acadians here prior to the 1755, and during the expulsion refugees fled to this location.
Transportation	1	- Utilized to get to other river systems, not a major ship building centre.
Persons/Concepts	3	- Outstanding individuals include Nicholas and Richard Denys, Le Clerq (1676) Father Lyonn founder of a mission, Enaud, Walker, and the Napier brothers who during the 1851 Australian gold rush discovered the world's largest nugget - 145 lbs.
Rare Finds	3	- Potential for historical sites, but also has known sites and collections.
Themes in Canadian History	4	- Sites representative of Canadian themes include the sites of Denys' post, Enaud's post, Walker's post, the site of an Acadian settlement.

TABLE 4-20 - NEPISIGUIT RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Human Heritage Scores		
Historical Development	3.3	
Persons/Concepts	3	
Rare Finds	3	
Themes in Canadian History	4	
Total	13.3 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 15.0	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	18	- Opportunity for canoeing/kayaking is good. Trips of up to five days are possible. Potential campsites are dispersed at irregular intervals; occasional class IV or higher rapids sequences exist which challenge expert canoeists; short to medium length portages are in good condition. Includes adjustment factor of 2.0.
Sport Fishing	4	- Opportunity for fishing is fair to poor. Adequate populations of Atlantic salmon and brook trout exist for sport fishing along some sections of the river only. Available fish tend to be small and nine kilometres of the river are closed.
Hunting	3.5	- Opportunity for hunting is good. Although white-tailed deer, moose, black bear, waterfowl, and small game exist, only beer and moose are known to have populations which are adequate to support hunting. Includes adjustment factor of 0.5.
Intensive Recreation	9	- Opportunity for intensive recreation activities is excellent. A variety of land-based and water-based activities may be carried out.

TABLE 4-20 - NEPISIGUIT RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Human Heritage Appreciation	5	- Opportunity for human heritage appreciation is fair to good. One museum, and several unmarked (visible and invisible) sites of historical significance have been identified along the river.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is excellent. Sightings of deer and moose are common; rare and beautiful plant species can be found along the river; landforms are varied and striking, and several sets of waterfalls exist.
Solitude/Backcountry	4	- Opportunity to experience solitude/backcountry is fair. Hydro wires, structures, roads, litter, and noise are all in evidence; potential for contact with other people varies with the season from low to high.
Physical Factors		
Water Flow	7	- Water flow is good. River depth, speed and width of most sections of the river is adequate from May to June every year, and Popple Depot to the mouth of the river is open until ice-up every year.
Navigability	7	- Navigability is good. Obstructions in the form of rocks, logs, and sandbars exist but do not significantly hinder navigability.
Access	7	- Access to river is good to very good. Points of access are frequent for small crafts and occasional for larger crafts.
Water Quality	10	- Water quality is excellent. Appearance with respect to color, odor, aquatic vegetation, and presence of solid waste along the river is acceptable for both land- and water-based activities.

TABLE 4-20 - NEPISIGUIT RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Shoreline	7	- Shoreline quality is suitable for most recreational purposes. Terrain in some areas is suitable for parking, camping and trails. Drainage is excellent; vegetation is varied from dense to light; slope varies but is generally flat.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	5	- Likelihood of negative social/psychological impacts is moderate. Conflicts may occur between anglers and canoeists.

Summary of Average Recreational Value Scores

Capabilities	7.2
Impacts/Sensitivities	7
Total	14.2 x (Score Index of 2.5) = 35.5

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the New Brunswick Highlands and the Maritime Plain.
Bedrock Geology	3	- Representation of one geologic era, three periods.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	9	- Representation of six stages of surficial development - alluvial, lacustrine and marine, glaciofluvial, morainal, and pre-quaternary sediments.
Features	5	- Fluted bedrock and drumlinoid ridges, esker, kame or isolated glaciofluvial deposit, meltwater channels.
Ongoing Processes		
Hydrology	8	- Very good representation of natural hydrologic characteristics of large rivers in drainage region; some lakes/wetlands associated; approximately 1/4 of length is tidal.
Water Quality	6.4	- Calcium bicarbonate - sulphate type; soft water; some variation of natural water quality. Includes adjustment factor of 0.8.
Morphology	8	- Representation of irregular channels and irregular meanders; terraces/floodplains; approximately 9 rapids, 48 islands, 22 bars.
Vegetation		
Features	6	- Representation of Restigouche, New Brunswick Highlands, and Maritime Lowlands ecoregions; some wetlands.
Alteration	7	- River environment altered somewhat by man; settlement, industry, forestry.

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	8	- Approximately 30 species of fish.
Natural Phenomena	8	- Crosses fault above Sunny Corner; falls above Stoney Brook (approximately 6m); valley attributed to synclinal depression and Appalachian trough; excellent seasonal concentrations of many fish species; fossils present.
Natural Beauty		
Features	9	- Variety of topography; highly varied vegetation patterns; varied channel patterns and surficial features, many natural phenomena.
Alteration	7	- River environment altered somewhat by man; settlement, industry, forestry.
Biota		
Rare/Endangered	6	- Plants considered rare (Cyperus rivularis, Sagittaria calycina var. spongiosa) and threatened (Epilobium ciliatum var. ecomosum, Eriocaulon parkeri, Scirpus smithii).
Species Concentrations	6	- Spring-summer runs of Atlantic salmon (large run; predominantly grilse), brook trout, American shad, striped bass, rainbow smelt, lamprey, alewife, blueback herring; fall run of Atlantic salmon (small run; predominantly grilse).

Summary of Average Natural Heritage Scores

Geological Development	4.9
Ongoing Processes	7.4
Natural Phenomena	8
Natural Beauty	8
Biota	6
Total	34.3 x (Score Index of 1.0) = 34.3

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
HUMAN HERITAGE VALUES		
Historical Development		
Native People	10	- Contains sites or evidence from all of the Native periods. Paleo period represented by paleo points discovered at Hogan-Mullin. Utilized for resource procurement (salmon, other fish species, lithics). Remains of 2,400-year-old cedar matting, birch bark matting, woven moose hair, a variety of seeds, nuts, copper, lithics, and bark from the Augustine Mound. The Augustine Mound demonstrates ceremonial beliefs or concepts, & mortuary practices. As such, it was recognized as a spot of special importance. The river is thought to have been a canoe route to various areas of the province, used to get to other river systems. The Red Bank area has been utilized for major Native settlements both historically and in the prehistoric period (Wilson-Howe-Tozer and the Hogan-Mullin areas). Evidence of trade networks is found in the historical record (Denys' establishment).
Settlement Patterns	9	- Two examples of military establishments. Richard Denys' fortified trading establishment of 1688, a centre for early development and trade. Miramichi Point and Beaubear's Island with associated Acadian and Scottish settlements, burial grounds, shipbuilding sites, and other commercial complexes like Denys' post were scattered around the confluence of the Northwest and Southwest. Historical documentation notes a French battery (ca. 1750) on Beaubear's Island. These were ideal locations along major transportation routes. Also a spool mill, lumber mills, steamer traffic. Good agricultural potential.

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
		Miramichi Point (Camp d'Esperance) settled by Acadian refugees (1755), also Scots lead by William Davidson (Davidson Family), other Scots from the Highland clearances, many Irish (1827, 47, 85, 86) and English Loyalists, disbanded military units such as the Black Watch. Military ventures include forays of Col. Murry, Wolfe and Sir Charles Hardy's punitive forces against French and Indian settlements (1758), American privateer attacks on Davidson and Cort (1770's-1780's). Resources include furs, lumber, masts, salmon and the fertile valley. Other factors: shipbuilding, the construction in 1944 of a river class frigate. HMCS STRATHAM, political movements (Fighting Election of 1843), early exploration by Jumeau - 1685, Franquelin and DeMeulles -1686, visits by LeClercq -pre 1691, St. Valier -1688, the leadership of individuals like Boishebert, Nicholas and Richard Denys, entrepreneurship of Davidson and Cort, continuous use of area by Native peoples. the portage route between this river system and the Nepisiguit.
Transportation	5	- In terms of transportation the Northwest Miramichi is not as significant as several of the other rivers. Transport of people or goods from Europe or within province not significant. Although river may have had shipbuilding sites, most shipbuilding sites would have been downstream of the confluence with the Southwest. Transportation routes were generally of a local nature and not major routes relative to the nation or the rest of the province. Transportation within province not greatly affected by this branch.

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Persons/Concepts	5	- Associated with development of ethnic traditions, Irish heritage, folk songs and Miramichi Folk Festival. Political movements; Fighting Election of 1843, Temperance Societies and Clubs in the late 1800's, various Lodges. Outstanding individuals include Denys, Boishebert, Murray, Hardy, Davidson and Cort, Beaverbrook.
Rare Finds	10	- Augustine Mound is a unique prehistoric structure. Denys' establishment opposite Beaubear's Island, and all the activity at the confluence of the Northwest and Southwest. Additionally, are all the small prehistoric sites.
Themes in Canadian History	10	- Contains several examples of outstanding prehistoric and historic sites representative of major Canadian themes. (Augustine Mound, shipbuilding sites, fur trade locations, Acadian and Davidson components at Miramichi Point).

Summary of Average Human Heritage Scores

Historical Development	8
Persons/Concepts	5
Rare Finds	10
Themes in Canadian History	10
Total	33 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 37.1

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	6	- Opportunity for canoeing/kayaking is adequate. Overnight trips are possible; potential campsites are dispersed at somewhat regular intervals, but are not established; occasional class II rapids sequences challenge intermediate paddlers; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	7	- Opportunity for fishing is fair to good. Adequate populations of Atlantic salmon and brook trout exist for sport fishing along some sections of the river.
Hunting	4.5	- Opportunity for hunting is good to very good. Adequate populations of large and small game exist for hunting along most sections of the river. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. Many land-based activities and a few water-based activities may be carried out along much of the river.
Human Heritage Appreciation	6	- Opportunity for human heritage appreciation is moderate. Visible and invisible sites exist along the river as do two National Historic Sites.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is good to very good. Both threatened and rare plant species can be found along the river; Sightings of deer and occasional coyote's may occur; several attractive waterfalls and rapids can be found on tributaries near river.

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Solitude/Backcountry	4	- Opportunity to experience solitude/backcountry is moderate. Structures, industry, power lines, roads, noise, and pollution are all present although power lines and roads are only visible occasionally, and structures are largely rural in nature. Contact with other people is high.
Physical Factors		
Water Flow	4	- Water flow is fair to good. River depth, speed and width is adequate during the spring and fall of every year.
Navigability	9	- Navigability is very good to excellent. Gravel bars occur occasionally, but other obstacles are rare.
Access	9	- Access to the river is very good. Points of access are frequent for small crafts and occasional for larger crafts.
Water Quality	10	- Water quality is very good. Appearance with respect to colour, odour, aquatic vegetation, and presence of solid waste is acceptable for both land- and water-based activities.
Shoreline	8	- Shoreline quality is adequate for most or all recreational purposes. Terrain is suitable for parking, beaches, camping, and trails. Drainage is good; vegetation is dense; and slope is gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between recreation groups.

TABLE 4-21 - NORTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Recreational Value Scores		
Capabilities	6.7	
Impacts/Sensitivities	9	
Total	15.7 x (Score Index of 2.5) = 39.3	

TABLE 4-22 - OROMOCTO RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the Maritime Plain and the New Brunswick Highlands.
Bedrock Geology	1	- Representation of one geologic era, one period.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	4	- Representation of three stages of surficial development; alluvial, organic, lacustrine and marine, and morainal sediments.
Features	5	- Drumlins, kames or isolated glaciofluvial deposits, meltwater channel, sand dunes.
Ongoing Processes		
Hydrology	8	- Very good representation of natural hydrologic characteristics of large rivers in drainage region; relatively large proportion of the drainage area as lakes/wetlands; approximately 20% of length is tidal.
Water Quality	6.3	- Calcium carbonate/sodium chloride-sulphate type; soft water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	9	- Representation of irregular channels, irregular, regular and tortuous meanders; terraces/floodplains; one waterfall, approximately 8 islands, 20 rapids and 7 oxbow lakes/associated features.
Vegetation		
Features	10	- Representation of Magaguadavic and Maritime Lowlands ecoregions; large extent of wetlands; organic sediments; unique ecosystem (Sunpoke Lake Marsh).

TABLE 4-22 - OROMOCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	8	- River environment somewhat altered by man; settlement, forestry.
Wildlife	10	- Approximately 30 species of fish; important waterfowl area for spring migrants and breeders, especially the lower stretch; some large deer wintering areas; moor hen in Sunpoke marshes; a few bald eagle breeding areas on system.
Natural Phenomena	9	- Gorge and waterfall in steeply dipping early Devonian sandstone beds (South Branch); numerous oxbow lakes/features; excellent seasonal concentrations of waterfowl, shore birds, white-tailed deer and several fish; fossils present.
Natural Beauty		
Features	9	- Highly varied channel patterns, vegetation patterns, and surficial features; waterfall, rapids, islands; many natural phenomena.
Alteration	8	- River environment somewhat altered by man; settlement, forestry.
Biota		
Rare/Endangered	9	- Endangered animal (bald eagle breeding area); plants considered rare (Ceratophyllum echinatum, Myriophyllum humile, Platanthera flava var. herbiola); animal considered rare (rusty spire snail, 1 of 3 N.B. locations).
Species Concentrations	9	- Spring-summer runs of alewife, American shad, lamprey, brook trout, striped bass; fall run of Atlantic salmon (small run; predominantly grilse); concentrations of migrating/breeding waterfowl and shore birds; concentrations of wintering white-tailed deer; concentrations of furbearers (muskrat).

TABLE 4-22 - OROMOCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	3.8	
Ongoing Processes	8.8	
Natural Phenomena	9	
Natural Beauty	8.5	
Biota	9	
Total	39.1 x (Score Index of 1.0) = 39.1	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	6	- Contains prehistoric sites from archaic, ceramic, and historic periods, including an archaic burial site, used as a canoe route to Lepreau and Magaguadavic rivers. Good potential for additional sites.
Settlement Patterns	6	- Contains a settlement that developed in part due to its proximity to a military establishment (Fort Hughes Blockhouse - Oromocto). Freneuse's 1690's habitation opposite the mouth. Settled by Irish and Loyalists. The lumber trade, and shipbuilding by the Pride family contributed to development.
Transportation	3	- Used to transport people and goods within the province (main route to Fredericton Junction) and had a shipbuilding business.
Persons/Concepts	3	- Local tradition tells of the sinking of a French vessel, and the associated sinking of a church bell in French Lake presumably in the late 1700's.
Rare Finds	5	- Contains prehistoric sites and historic structures with authentic, appealing, or interesting appearance. In addition, dugways and kilns, and the only known petroglyph in the province.

TABLE 4-22 - OROMOCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Themes in Canadian History	3	- No specific sites identified. Red Paint cultural tradition.
Summary of Average Human Heritage Scores		
Historical Development	5	
Persons/Concepts	3	
Rare Finds	5	
Themes in Canadian History	3	
Total	16 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 18.0	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	10	- Opportunity for canoeing/kayaking is fair. Trips of one or two days are possible; moving water challenges novice or intermediate canoeists; portages are sometimes necessary but do not always exist. Includes adjustment factor of 2.0.
Sport Fishing	7	- Opportunity for fishing is good. Adequate populations of several species (brook trout, smallmouth bass, pickerel) exist for sport fishing along some sections of the river.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game and some waterfowl exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	8	- Opportunity for intensive recreation activities is good to very good. Many different land- and water-based activities may be carried out along the length of the river.

TABLE 4-22 - OROMOCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Human Heritage Appreciation	7	- Opportunity for human heritage appreciation is good. Two or more active or marked sites of historical significance are present, as well as several invisible prehistoric archaeological sites.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Unique and/or attractive vistas can be found; several unique and/or rare species of flora and fauna are present in the area; waterfalls are present in the upper sections of the river; some plants of exceptional beauty can be found.
Solitude/Backcountry	5	- Opportunity to experience solitude/backcountry is moderate. Roads, power lines, noise, structures and industry are all present; contact with other people is low to moderate along most sections of the river.
Physical Factors		
Water Flow	7	- Water flow is good. River depth, speed and width are adequate from May to September of every year.
Navigability	7	- Navigability is fair to good. Rocks are numerous in the upper sections of the river, especially at times of low water flow; deadheads, weirs, and waterfalls occur rarely.
Access	7	- Access to river is fair to good. Access points for small crafts are frequent, but rare for larger crafts.
Water Quality	8	- Water quality is very good. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both land- and water-based activities. However, tea-coloured water and occasional water plants may limit appeal for water-based activities to some users.

TABLE 4-22 - OROMOCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Shoreline	4	- Shoreline quality is fair for some recreational purposes. Terrain is suitable for parking in some locations. Drainage is poor along the lower sections; vegetation is light with some wetlands; slope varies from steep to flat.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between groups.

Summary of Average Recreational Value Scores

Capabilities	6.7
Impacts/Sensitivities	9
Total	15.7 x (Score Index of 2.5) = 39.3

TABLE 4-23 - PATAPEDIA RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the Notre Dame Mountains and the Chaleur Uplands.
Bedrock Geology	4	- Representation of one geologic era, three periods; Matapedia and Grog Brook rock groups, Temiscouata formation.
Palaeontology	5	- Corals, trilobites, crinoids, brachiopods.
Surficial Geology		
Development	3	- Representation of two stages of surficial development; morainal and pre-quaternary sediments.
Features	0	- No distinguishable surficial features.
Ongoing Processes		
Hydrology	6	- Good representation of natural hydrologic characteristics of rivers in drainage region; some lakes/wetlands associated.
Water Quality	2.7	- Calcium bicarbonate type; moderately hard water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	3	- Representation of irregular channels and irregular meanders; approximately 1 island and 1 bar.
Vegetation		
Features	2	- Representation of Restigouche, Maritime Uplands, and New Brunswick Highlands ecoregions.
Alteration	10	- River environment altered little by man; settlement.
Wildlife	9	- Approximately 12 species of fish; Canada lynx habitat.

TABLE 4-23 - PATAPEDIA RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Phenomena	6	- Fossils present; geological formation; seasonal concentrations of several fish species.
Natural Beauty		
Features	9	- Variety of topography; highly varied vegetation pattern; varied channel patterns; some natural phenomena; highly distinguishable landforms/landscape.
Alteration	10	- River environment altered little by man; settlement.
Biota		
Rare/Endangered	9	- Endangered animal (Canada lynx).
Species Concentrations	2	- Spring-summer runs of brook trout, lamprey, Atlantic salmon (predominantly large salmon); fall run of Atlantic salmon (predominantly large salmon).
Summary of Average Natural Heritage Scores		
Geological Development	4.4	
Ongoing Processes	5.6	
Natural Phenomena	6	
Natural Beauty	9.5	
Biota	5.5	
Total	31 x (Score Index of 1.0) = 31.0	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	1	- No known sites or collections.
Settlement Patterns	1	- Not known to have been settled for military or agricultural reasons, not settled by significant numbers of specific groups.
Transportation	1	- Not important for transportation in New Brunswick.
Persons/Concepts	1	- Data gap.
Rare Finds	1	- Possible isolated finds.
Themes in Canadian History	1	- No known sites.

TABLE 4-23 - PATAPEDIA RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Human Heritage Scores		
Historical Development	1	
Persons/Concepts	1	
Rare Finds	1	
Themes in Canadian History	1	
Total	4 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 5.0	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	14	- Opportunity for canoeing/kayaking is good. Overnight trips are possible and many sets of rapids exist. Campsites are not available on the New Brunswick side of the river, and portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	7	- Opportunity for fishing is moderate. Some sections of the river have an adequate salmon population to support sport fishing.
Hunting	4.5	- Opportunity for hunting is very good. Many Sections of the river provide access for hunting to both large and small game. Includes adjustment factor of 0.5.
Intensive Recreation	5	- Opportunity for intensive recreation activities is fair. On some sections of the river potential exists for a few land- and water-based activities to be carried out.
Human Heritage Appreciation	1	- Opportunity for human heritage appreciation is very poor. There are no reported sites of cultural or historical significance.

TABLE 4-23 - PATAPEDIA RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are varied and striking, animal sightings are common, and the river environment provides habitat for the Canada lynx.
Solitude/Backcountry	10	- Opportunity to experience solitude/backcountry is excellent. Litter, roads, power lines, noise, structures and industry are rarely, if ever in evidence. Chance of contact with other people is very low.
Physical Factors		
Water Flow	7	- Water flow is good. River depth, speed and width are adequate during some parts of every year.
Navigability	6	- Navigability is fair. Rock obstructions are frequent, especially at low water levels.
Access	2	- Access to river is very poor. Few access points to the river currently exist, most of which are located in Quebec.
Water Quality	10	- Water quality is excellent. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both land- and water-based activities.
Shoreline	4	- Shoreline quality is adequate for some recreational purposes only. Terrain may be suitable for camping and trails. Drainage is good, vegetation is dense, and slope is very steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Likelihood of physical/ecological impacts as a result of recreational use is low.

TABLE 4-23 - PATAPEDIA RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is very low. Space on the river corridor is more than adequate and there is little likelihood of conflict between groups.

Summary of Average Recreational Value Scores

Capabilities	6.4
Impacts/Sensitivities	9.0
Total	15.4 x (Score Index of 2.5) = 38.5

TABLE 4-24 - PETITCODIAC RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the New Brunswick Highlands and the Maritime Plain.
Bedrock Geology	2	- Representation of one geologic era, one period; Albert formation.
Palaeontology	10	- Rare fish fossils (Palaeoniscids, species alberti unique to N.B.), skeletal remains of mastodon.
Surficial Geology		
Development	7	- Representation of five stages of surficial development; marine, alluvial, morainal, and pre-quaternary sediments.
Features	2.5	- Kames or isolated glaciofluvial deposits, sink holes.
Ongoing Processes		
Hydrology	2	- Very good representation of significant hydrologic features, tidal bore, approximately 15% of length is tidal; regulated flow.
Water Quality	5.4	- Calcium bicarbonate/sodium chloride-sulphate type; soft to moderately hard water; large variation of natural water quality due to influence of evaporitic deposits. Includes adjustment factor of 0.9.
Morphology	6	- Representation of irregular meander and irregular channels; terraces/floodplains; approximately 16 oxbow lakes/associated features.
Vegetation		
Features	5	- Representation of Magaguadavic and Maritime Lowlands ecoregions; some wetlands.

TABLE 4-24 - PETITCODIAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	1	- River environment severely altered by man; settlement, agriculture, industry.
Wildlife	9	- Approximately 12 species of fish; significant use by waterfowl in spring, fall and winter from Moncton to river mouth; bald eagle breeding area; dwarf wedge-mussel habitat (1 of 2 Canadian locations); swollen wedge-mussel habitat (only N.B. location).
Natural Phenomena	8	- Tidal bore; numerous oxbow lakes/features, excellent seasonal concentrations of waterfowl and several fish species; fossils present; geological formation.
Natural Beauty		
Features	8	- Variety of topography and land-water relations; varied vegetation patterns; interesting landforms; superior/frequent viewing opportunities; several natural phenomena.
Alteration	1	- River environment severely altered by man; settlement, agriculture, industry.
Biota		
Rare/Endangered	9	- Endangered animal (bald eagle breeding area); animals considered rare (swollen wedge-mussel, only N.B. location) and endangered (dwarf wedge-mussel, 1 of 2 Canadian locations); plants considered rare (Lobelia spicata, Carex hirtifolia, Carex tenuifolia, Goodyera pubescens.
Species Concentrations	7	- Spring-summer runs of alewife, striped bass, rainbow smelt, American shad; summer-fall run of Atlantic salmon (small run; predominantly grilse); concentrations of waterfowl in spring, fall, and winter below Moncton.

TABLE 4-24 - PETITCODIAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	6	
Ongoing Processes	5.4	
Natural Phenomena	8	
Natural Beauty	4.5	
Biota	8	
Total	31.9 x (Score Index of 1.0) = 31.9	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	6	- Contains examples of archaeological sites or evidence from all of the Native periods. Paleo period represented by paleo point at New Horton Creek. Although the Hillsborough Mastodon is of no consequence for human heritage it is also noted. River does not fulfil other requirements for the first two levels. In particular there is no record of religious or ceremonial beliefs, or concepts, or examples of mortuary practises, or locations of significant singular events related to Native culture. This may in part be due to the fact that intensive prehistorical archaeological investigations have not been carried out on the river. An important canoe route. Two different routes or portages to the Saint John allowed communication between Nova Scotia and Upper Canada. Others to Shediac, and Baie Verte areas. The predictive potential of the river should be good as this was a major thoroughfare for prehistoric and historic peoples. Disturbance may be a factor.

TABLE 4-24 - PETITCODIAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Settlement Patterns	7	- During data collection no sites were specifically recorded as trading locations. In the instance of the Petitcodiac this is being overlooked. It is probable on a river such as the Petitcodiac, there were trading locations. The Petitcodiac is known to contain a military establishment (Fort Folly). Acadian farms and dykes still remain. Moncton developed in part due to its position on a transportation route and as a commercial centre. The river was an exit point and/or entry point for significant numbers of a cultural group (Acadian settlement ca. 1698, Acadian expulsion 1755, French, English, Scots, Irish, Loyalist, Germans -1763 from Pennsylvania at Hillsborough). Staging area for the expulsion of the Acadians and as such there were several military ventures, including the Battle of the Petitcodiac near Hillsborough - 1755 where Boishebert defeated the English. Resources from the river environment included fish and lumber.
Transportation	6	- Played a significant role in the transport of people from Europe to New Brunswick and within the province. Settlements developed because of their association with a major transportation route (Moncton-rail) and were associated with the housing and supplying of machinery, or individuals travelling or working on the railway. Shipbuilding was an industry that was important to several riverside communities.

TABLE 4-24 - PETITCODIAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Persons/Concepts	8	- Closely associated with Acadian traditions. Free Meeting House associated with the practise of religious beliefs. Individuals associated with the river; Boishebert, Frye, Scott-military, R.B. Bennett, Hon. Wm. Steeves-Politics. Places or events include Fort Folly lighthouse-1818, Acadian settlements of Babineau, Fourche, a Crepaud le Petitcodiac, Battle of Petitcodiac, and burial of the dead on a nearby marsh, French and American privateer sloops captured at various anchorages along the river.
Rare Finds	6	- Contains prehistoric sites from ceramic, contact and historic periods, and historic period sites from the Acadian period to present.
Themes in Canadian History	6	- The New Horton Creek paleo point is an outstanding artifact from the earliest period of human occupation in the province. The low score of 6 was assigned because only the general area of the find is known. The settlements of Acadians, and sites related to their expulsion are included, but with many of the examples there are no remains or the exact location can not be identified. Also included are generalized locations of early shipyards.

Summary of Average Human Heritage Scores

Historical Development	6.3
Persons/Concepts	8
Rare Finds	6
Themes in Canadian History	6
Total	26.3 x (Human Heritage Adjustment Factor of 0.8) x (Score Index of 1.25) = 26.3

TABLE 4-24 - PETITCODIAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	4	- Opportunity for canoeing/kayaking is very poor. Only some sections of the river are appropriate for canoeing and overnight trips are not usually undertaken. Water is generally slow and few or no rapids sequences exist; portages are not required. Includes adjustment factor of 2.0.
Sport Fishing	3	- Opportunity for fishing is fair to poor. Potential exists for Atlantic salmon fishing on some sections of the river only.
Hunting	3.5	- Opportunity for hunting is good. Adequate populations of deer, small game and waterfowl exist for hunting along most sections of the river. Includes adjustment factor of 0.5.
Intensive Recreation	3	- Opportunity for intensive recreation activities is fair. A few land-based activities may be carried out along some sections of the river, but water quality is not appropriate for water-based activities.
Human Heritage Appreciation	9	- Opportunity for human heritage appreciation is very good. Several museums and many visible sites can be found along the river.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Several rare plant species can be found at along the river. Sightings of waterfowl and bald eagle may occur. Landforms are attractive but typical.

TABLE 4-24 - PETITCODIAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Solitude/Backcountry	2	- Opportunity to experience solitude/backcountry is poor. Litter, roads, power lines, noise, structures and industry are common; potential for contact with other people is high.
Physical Factors		
Water Flow	9	- Water flow is very good. River depth, speed and width is adequate from May to September of every year.
Navigability	7	- Navigability is good. Sandbars are frequent, rocks and other obstacles are rare.
Access	5	- Access to river is fair. Points of access for small crafts occur occasionally, but are rare or non-existent for larger crafts.
Water Quality	4	- Water quality is poor. Appearance with respect to color, odor, aquatic vegetation, and presence of solid waste is acceptable for land-based activities only.
Shoreline	3	- Shoreline quality is adequate for some recreational purposes. Terrain is suitable in some areas for parking and trails. Drainage is fair, vegetation is light, and slope is very gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	8	- Some potential exists for physical/ecological impacts as a result of recreational use. Compaction may occur on some sections of the river.
Social/Psychological Impacts	5	- Likelihood of negative social/psychological impacts is moderate. Space on the river corridor is adequate but there is considerable likelihood of conflict between some recreation groups.

TABLE 4-24 - PETITCODIAC RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Recreational Value Scores		
Capabilities	4.9	
Impacts/Sensitivities	6.5	
Total	11.4 x (Score Index of 2.5) = 28.5	

TABLE 4-25 - PORTOBELLO RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the Maritime Plain.
Bedrock Geology	1	- Representation of one geologic era, one period.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	3	- Representation of two stages of surficial development; alluvial, organic, and morainal sediments.
Features	0	- No distinguishable surficial features.
Ongoing Processes		
Hydrology	6	- Small drainage area, very large proportion of drainage area as lakes/wetlands; good representation of variable hydrologic conditions, tidally influenced.
Water Quality	1	- Insufficient data for assessment.
Morphology	4	- Representation of irregular channels and irregular meanders; terraces/floodplains; approximately 3 islands.
Vegetation		
Features	10	- Representation of Magaguadavic and Maritime Lowlands ecoregions; large extent of wetlands; organic sediments; unique ecosystem (Portobello Creek floodplain forest).
Alteration	9	- River environment altered little by man; settlement, forestry.

TABLE 4-25 - PORTOBELLO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	10	- Approximately 15 species of fish; important area for waterfowl throughout, black ducks in spring and fall; significant wood duck breeding area in province; one of the best breeding bird areas in the Maritimes; black tern colony; bald eagle breeding area.
Natural Phenomena	8	- Excellent seasonal concentrations of waterfowl and other birds, some species of fish; fossils present.
Natural Beauty		
Features	9	- Variety of topography and land-water relations; varied channel pattern; highly varied vegetation patterns, several natural phenomena.
Alteration	9	- River environment altered little by man; settlement, forestry.
Biota		
Rare/Endangered	9	- Endangered animal (bald eagle breeding area).
Species Concentrations	6	- Spring-summer runs of alewife, blueback herring, lamprey; concentrations of black ducks, wood ducks, black terns, and other waterfowl; concentrations of furbearers (muskrat).

Summary of Average Natural Heritage Scores

Geological Development	2
Ongoing Processes	6.8
Natural Phenomena	8
Natural Beauty	9
Biota	7.5
Total	33.3 x (Score Index of 1.0) = 33.3

TABLE 4-25 - PORTOBELLO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
HUMAN HERITAGE VALUES		
Historical Development		
Native People	2	- Sites recorded only around the mouth. The area may have been utilized for resource procurement.
Settlement Patterns	1	- No settlement development for military or agricultural reasons. Not known as a settlement or exit point.
Transportation	1	- Not known as important river for transportation routes, or transport of goods in New Brunswick.
Persons/Concepts	1	- No development of political movements, ethnic traditions. No outstanding individuals.
Rare Finds	2	- There are artifact collections from around the mouth, as well as features.
Themes in Canadian History	1	- No known sites.
Summary of Average Human Heritage Scores		
Historical Development	1.3	
Persons/Concept	1	
Rare Finds	2	
Themes in Canadian History	1	
Total	5.3 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 6.6	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	6	- Opportunity for canoeing/kayaking is poor to adequate. Overnight trips are not usually undertaken and the river has little fast-moving water. Includes adjustment factor of 2.0.

TABLE 4-25 - PORTOBELLO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Sport Fishing	5	- Opportunity for fishing is fair. Trout fishing is possible in spring and other species including perch and pickerel may be fished throughout the season.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of deer, bear, small game, and waterfowl exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	5	- Opportunity for intensive recreation activities is fair. Several land-based activities and one or two water-based activities may be carried out along some sections of the river.
Human Heritage Appreciation	2	- Opportunity for human heritage appreciation is poor. No sites of historical or cultural significance have been identified along this river.
Natural Values		
Natural Attractions	7	- Opportunity for appreciation of scenic beauty is good. Landforms and opportunities for appreciation of plants and/or wildlife are interesting but typical.
Solitude/Backcountry	8	- Opportunity to experience solitude/backcountry is good to very good. Litter, roads, power lines, noise, etc. are few in number and concentrated at the source. Contact with other people is infrequent.
Physical Factors		
Water Flow	8	- Water flow is good to excellent. River depth, speed and width is adequate during most of every year.
Navigability	9	- Navigability is excellent. Obstructions are very rare.
Access	5	- Access to river is poor to fair. Occasional access points exist for small crafts.

TABLE 4-25 - PORTOBELLO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Water Quality	10	- Water quality is very good. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both land- and water-based activities.
Shoreline	8	- Shoreline quality is very good for some recreational purposes. Terrain is suitable for camping and trails. Drainage is excellent, vegetation is dense to light, and slope is flat.
Impacts/Sensitivities		
Physical/Ecological Impacts	7	- Physical/ecological impacts as a result of recreational use is likely to be limited. However, some wildlife may be affected by excessive activity.
Social/Psychological Impacts	5	- Likelihood of negative social/psychological impacts is moderate. Space on the river corridor is adequate but there is some chance of conflict between anglers and canoeists.

Summary of Average Recreational Scores

Capabilities	6.2
Impacts/Sensitivities	6
Total	12.2 x (Score Index of 2.5) = 30.5

TABLE 4-26 - RESTIGOUCHE RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the Chaleur Uplands.
Bedrock Geology	4	- Representation of one geologic era, three periods; Grog Brook, Matapedia, and Chaleur rock groups.
Palaeontology	5	- Brachiopods, graptolites, trilobites, crinoids, bryozoans.
Surficial Geology		
Development	5	- Representation of four stages of surficial development; alluvial, marine, glaciofluvial, morainal, and pre-quaternary sediments.
Features	2.5	- Meltwater channels.
Ongoing Processes		
Hydrology	9	- Large drainage area, excellent representation of variable hydrologic characteristics of large rivers with natural flow; river is tidally influenced.
Water Quality	4	- Calcium bicarbonate type; moderately hard water; some variation of natural water quality. Includes adjustment factor of 1.0.
Morphology	6	- Representation of irregular channels and irregular meanders; terraces/floodplains; approximately 92 islands and 44 bars.
Vegetation		
Features	5	- Representation of Restigouche and Maritime Uplands ecoregions; some wetlands.
Alteration	7	- River environment altered somewhat by man; settlement, industry, forestry.

TABLE 4-26 - RESTIGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	10	- Approximately 20 species of fish; important waterfowl nesting at mouth and important for fall concentrations of ducks; Barrows goldeneye wintering area at mouth of river; one major deer wintering area; abundance of furbearers, especially beaver, on islands in lower river.
Natural Phenomena	8	- Chamberlain shoals (2 m vertical drop); gulchs of 300 m along river; many ledge outcrops; excellent seasonal concentrations of many fish species, waterfowl, and white-tailed deer; fossils present.
Natural Beauty		
Features	9	- Variety of topography, vegetation patterns, and channel patterns; many islands; several natural phenomena.
Alteration	7	- River environment altered somewhat by man; settlement, industry, forestry.
Biota		
Rare/Endangered	6	- Plants considered rare (Carex crawei, Equisetum variegatum, Saleginella selaginoides, Woodsia gracilis) and threatened (Gymnocarpium robertianum, Woodsia alpina, Gymnocarpium jessoense spp. parvulum).
Species Concentrations	8	- Spring-summer runs of alewife, American shad, striped bass, lamprey, Atlantic salmon (large run; predominantly large salmon), brook trout (large run); fall run of Atlantic salmon (small run; predominantly large salmon), brook trout (small run); concentration of furbearers (beaver); concentrations of wintering white-tailed deer; concentrations of waterfowl in spring-summer-fall, wintering area for Barrows goldeneye.

TABLE 4-26 - RESTIGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	4	
Ongoing Processes	7.1	
Natural Phenomena	8	
Natural Beauty	8	
Biota	7	
Total	34.1 x (Score Index of 1.0) = 34.1	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	6	- No known paleo or archaic period sites on the Restigouche. Contains prehistoric sites (palisaded settlement at Mission Point), used as a canoe route (two to the Saint John River system, one was very important). There is good potential for other sites, especially at the mouth of some of the larger tributaries.
Settlement Patterns	6	- Early development centred around the mouth. Several trading establishments operated in the area (Nicholas Denys-1675, and later his son Richard Denys, Walker, Shoolbreds' salmon fishery and pickling factory ca. 1770's, Ferguson's Athol House 1810). Acadians settled Campbellton area and Scots around Ferguson's establishment at Atholville. Businesses in the area include the Denys' fishery and fur trade, Shoolbred's salmon fishery and pickling factory, Ferguson's salmon fishery, fur trade and lumber business. Ferguson's base was the centre of Restigouche from 1810 to 1890.

TABLE 4-26 - RESTIGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Transportation	6	- Transport of supplies and trade goods to 'Restigouche' from Europe, shipments of fish to the Mediterranean and other European centres, shipments of other natural resources to England and France.
Persons/Concepts	4	- Persons associated with the development of the region include Nicholas and Richard Denys, Commadore Walker, John Shoolbred, Robert Ferguson, Father Sebastion the 1st Recollet in the area, Captain Byron commander of the British fleet. Events or locations important are Battle of the Restigouche 1760, fortified Native settlement at Old Mission Point, Athol House.
Rare Finds	7	- Old Mission Point and the site of the Battle of the Restigouche.
Themes in Canadian History	5	- Due to the loss of supplies, the Battle of the Restigouche is felt by some to be the beginning of the turning point of the English-French struggle in North America, an important event in Canadian history. The site of Old Mission Point with its various components represent themes in New Brunswick history.

Summary of Average Human Heritage Scores

Historical Development	6
Persons/Concepts	4
Rare Finds	7
Themes in Canadian History	5
Total	22 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 24.8

TABLE 4-26 - RESTIGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	16	- Opportunity for canoeing/kayaking is good. Trips of up to five days are possible. Potential campsites are dispersed at irregular intervals; occasional class III rapids sequences exist which challenge intermediate and expert canoeists; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	5	- Opportunity for fishing is fair. Adequate populations of Atlantic salmon and brook trout and lake whitefish exist for sport fishing along most sections of the river. Portions of the river are leased and not open to the general public for salmon and trout fishing.
Hunting	1.5	- Opportunity for hunting is fair to poor. Although white-tailed deer, waterfowl, and small game exist, it is not known whether their populations are adequate to support hunting. Includes adjustment factor of 0.5.
Intensive Recreation	5	- Opportunity for intensive recreation activities is fair. A few land-based activities and occasional water-based activities may be carried out.
Human Heritage Appreciation	5	- Opportunity for human heritage appreciation is fair. Several visible and invisible (unmarked) sites of historical significance exist along the river.

TABLE 4-26 - RESTIGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is good to very good. Sightings of deer, waterfowl, and small fur-bearing animals are common; rare and threatened plant species can be found. Landforms are varied and occasionally give a 'feeling of isolation'.
Solitude/Backcountry	5	- Opportunity to experience solitude/backcountry is moderate. Hydro wires, roads, litter, sewage, noise, and structures are all in evidence; potential for contact with other people is high.
Physical Factors		
Water Flow	9	- Water flow is very good to excellent. River depth, speed and width is adequate from May to October during every year.
Navigability	7	- Navigability is good. Obstructions in the form of rocks and sandbars exist but do not significantly hinder navigability.
Access	5	- Access to river is fair. Points of access for small crafts are occasional, but the access points for larger crafts are concentrated at the mouth of the river.
Water Quality	7	- Water quality is fair. Appearance with respect to color, odor, aquatic vegetation, and presence of solid waste along the river is acceptable for both land- and water-based activities, although erosion in some areas may be unappealing to some users.
Shoreline	5	- Shoreline quality is fair for most recreational purposes. Terrain in some areas is suitable for parking, camping, and trails. Drainage varies from good to poor; vegetation is varied from dense to light; slope is generally steep.

TABLE 4-26 - RESTIGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Impacts/Sensitivities		
Physical/Ecological Impacts	6	- There is potential for physical/ecological impacts as a result of recreational use. Excessive use in recent years may be causing serious impacts in terms of site destruction, water quality, erosion, compaction, etc.
Social/Psychological Impacts	3	- Likelihood of negative social/psychological impacts is high. Conflicts occur between anglers and canoeists, land owners and campers, and swimmers and anglers.

Summary of Average Recreational Scores

Capabilities	6.4
Impacts/Sensitivities	4.5
Total	10.9 x (Score Index of 2.5) = 27.3

TABLE 4-27 - RICHIBUCTO RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the Maritime Plain.
Bedrock Geology	1	- Representation of one geologic era, one period.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	3	- Representation of three stages of surficial development; marine, morainal, and pre-quaternary sediments.
Features	0	- No distinguishable surficial features.
Ongoing Processes		
Hydrology	6	- Good representation of natural hydrologic characteristics of rivers in drainage region; moderate representation of lakes/wetlands associated; approximately 42% of length is tidal.
Water Quality	3.2	- Calcium bicarbonate to sodium chloride type; soft water; some variation of natural water quality. Includes adjustment factor of 0.8.
Morphology	3	- Representation of irregular channels and irregular meanders; approximately 11 islands and 3 bars.
Vegetation		
Features	6	- Representation of Maritime Lowlands ecoregion; moderate extent of wetlands.
Alteration	7	- River environment altered somewhat by man; settlement, forestry, agriculture.

TABLE 4-27 - RICHIBUCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	9	- Approximately 10 species of fish; important habitat in lower river for migrating black ducks and other waterfowl; bald eagle breeding area, one of the very few in the eastern part of the province.
Natural Phenomena	6	- Seasonal concentrations of waterfowl and several fish species; fossils present.
Natural Beauty		
Features	8	- Variety of channel patterns and vegetation patterns; islands; some natural phenomena.
Alteration	7	- River environment altered somewhat by man; settlement, forestry, agriculture.
Biota		
Rare/Endangered	9	- Endangered animal (bald eagle breeding area); plants considered rare (*Juncus stygius* spp. *americanus*, *Oryzopsis pungens*, *Juncus greenei*, *Sagittaria calycina* var. *spongiosa*).
Species Concentrations	8	- Spring-summer runs of brook trout, lamprey, striped bass, rainbow smelt; fall run of Atlantic salmon (small run); concentrations of migrating waterfowl (especially black duck).

Summary of Average Natural Heritage Scores

Geological Development	2
Ongoing Processes	5.8
Natural Phenomena	6
Natural Beauty	7.5
Biota	8.5
Total	29.8 x (Score Index of 1.0) = 29.8

TABLE 4-27 - RICHIBUCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
HUMAN HERITAGE VALUES		
Historical Development		
Native People	8	- Contains archaic, ceramic, contact and historic period sites. Thought to have been utilized for resource procurement. Examples of religious and ceremonial concepts, and mortuary practises represented at the Richibucto Burial site. From the historical record the Richibucto is known to have been a canoe route with portages connecting the Saint John system. Native palisade settlement at the mouth of the river at contact, primitive crops possibly grown.
Settlement Patterns	6	- Settlement centred around De Chauffours' palisaded dwelling at mouth. Area settled before 1755 by Acadians, after expulsion refugees settled area. English settled the area ca. 1787, also settled by Loyalists, Scots and Irish. Businesses in the area included shipbuilding and lumber business.
Transportation	5	- Area was a major ship producer from the early 1800's until the end of the era. Substantial trade with Europe. Richibucto's growth in part due to its being a terminus of sea routes.
Persons/Concepts	3	- Individuals of note include the Jardine family, Bonar Law, Peter Veniot.
Rare Finds	6	- Richibucto burial site, other prehistoric sites and structures such as Bonar Law House.
Themes in Canadian History	1	- Bonar Law House.

TABLE 4-27 - RICHIBUCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Human Heritage Scores		
Historical Development	6.3	
Persons/Concepts	3	
Rare Finds	6	
Themes in Canadian History	1	
Total	16.3 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 18.4	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	6	- Opportunity for canoeing/kayaking is fair to poor. Overnight trips are not generally appropriate; campsites are dispersed at somewhat regular intervals; water may be swift, but few or no rapids sequences exist; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	9	- Opportunity for fishing is very good. Adequate populations of several species exist for sport fishing along most sections of the river.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game, and waterfowl exist for hunting along most sections of the river. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. Several land-based activities may be carried out along much of the river, but many water-based activities are concentrated at the mouth of the river.
Human Heritage Appreciation	9	- Opportunity for human heritage appreciation is very good. Many active, visible, and invisible sites exist along the river.

TABLE 4-27 - RICHIBUCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Several rare plant species can be found; sightings of deer, moose, waterfowl and bald eagle may occur; fall foliage is pretty in some areas; unique/attractive vistas can be found.
Solitude/Backcountry	8	- Opportunity to experience solitude/backcountry is good to very good. Occasional power lines and roads can be seen; presence of structures, industry and pollution are minimal; contact with other people is low to medium.
Physical Factors		
Water Flow	5	- Water flow is fair to good. River depth, speed and width is adequate during two months of every year.
Navigability	9	- Navigability is good. Sandbars and rocks occur occasionally but do not seriously hinder navigation; other obstacles are rare.
Access	7	- Access to river is good. Points of access for small and large crafts occur occasionally.
Water Quality	10	- Water quality is very good. Appearance with respect to color, odor, aquatic vegetation, and presence of solid waste is acceptable for both land- and-water based activities.
Shoreline	8	- Shoreline quality is adequate for most recreational purposes. Terrain is suitable for parking, beaches, camping, and trails. Drainage is good, vegetation is dense to light, and slope is steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.

TABLE 4-27 - RICHIBUCTO RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between recreation groups.

Summary of Average Recreational Scores

Capabilities	7.3
Impacts/Sensitivities	9
Total	16.3 x (Score Index of 2.5) = 40.8

TABLE 4-28 - SAINT JOHN RIVER - LOWER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the Maritime Plain and the New Brunswick Highlands.
Bedrock Geology	9	- Representation of two geologic eras, five periods; Coldbrook, Saint John, and Green Head rock groups.
Palaeontology	10	- Precambrian stromatolite (oldest fossil in N.B.) trilobites, brachiopods, crinoids, rare ice age seal fossil.
Surficial Geology		
Development	8	- Representation of five stages of surficial development; alluvial, organic, lacustrine/marine, glaciofluvial, morainal and pre-quaternary sediments.
Features	10	- Fluted bedrock and drumlinoid ridges, drumlin, moraine ridges, meltwater channels, delta, sand dunes, kame or isolated glaciofluvial deposits.
Ongoing Processes		
Hydrology	2	- Very large drainage area, relatively high proportion of drainage area as lakes/wetlands; extreme tidal range, over 90% of length is tidal; regulated flow.
Water Quality	3.2	- Calcium bicarbonate type; soft water; some variation of natural water quality. Includes adjustment factor of 0.8.
Morphology	7	- Representation of irregular channels; terraces/floodplains; reversing falls rapids, approximately 46 islands, 25 bars.

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
Vegetation		
Features	10	- Representation of Restigouche and Magaguadavic ecoregions; organic sediments; large extent of wetlands; unique ecosystems (Gilbert Island floodplains, Currie Mountain mixed wood stand).
Alteration	1	- River environment severely altered by man; settlement, industry, agriculture.
Wildlife	10	- Approximately 40 species of fish; very important area for breeding and migrating waterfowl, probably the best in Atlantic Canada; Grassy Island, the only breeding area for greater scaup in New Brunswick; Canada geese spring migration concentrations at Jemseg, along with other waterfowl species; waterfowl migration at Westfield, Evandale, Oak Island; waterfowl wintering area at Saint John; Spoon Island, important moulting area for ducks; marshes and islands in Greenwich area important feeding grounds for spring waterfowl as well as nesting and loafing; Lower Musquash Island, Gilbert Island, significant waterfowl areas.
Natural Phenomena	10	- Currie Mountain (approximately 85 m above sea level, formed by volcanic intrusion); linear ridge of sand dunes up to 20 m high (below Lincoln); Silurian siltstone and fine-grained sandstone exhibit well-developed slaty cleavage (Hampstead); vertically dipping Silurian mafic volcanics and minor interbedded sedimentary rocks (Evandale); 5 km diameter Devonian granite stock exposed (near Hampstead); Belleisle Fault cause of Long Reach and Belleisle Bay; Reversing Falls Gorge (result of tectonic activity; lower Ordovician shale in fault contact with Precambrian limestone);

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
		unconformable contacts between Precambrian and Cambrian rocks, heavy faulting (Saint John); numerous species of fossils in Cambro-Ordovician rocks; river crosses prominent fault at Silverwood; cliffs at Grand Bay; extreme tidal range; stream piracy (captured headwaters of Richibucto); excellent seasonal concentrations of waterfowl, shorebirds, and many fish species.
Natural Beauty		
Features	10	- Variety of topography and land-water relations; islands, rapid; highly varied vegetation patterns and surficial features; many natural phenomena; interesting rock formation; superior/frequent viewing opportunities.
Alteration	1	- River environment severely altered by man; settlement, industry, agriculture.
Biota		
Rare/Endangered	10	- Endangered animals (several bald eagle breeding areas and peregrine falcon breeding area), Canadian rare species (shortnose sturgeon), other rare animals (yellow lamp-mussel, 1 of 2 Canadian locations; ocher lamp-mussel, 1 of 3 N.B. locations); plants considered rare (*Carex plantaginea*, *Selaginella rupestris*, *Cyperus diandrus*, *Scirpus fluviatilis*, *Leersia virginica*, *Lysimachia quadrifolia*, *Potamogeton friesii*).
Species Concentrations	10	- Spring-summer runs of Atlantic salmon (large run; predominantly grilse), alewife, blueback herring, American shad, lamprey, rainbow smelt, striped bass, brook trout; fall run of Atlantic salmon (smaller run; predominantly grilse); large concentrations of several species of migrating/breeding ducks, geese, shorebirds; gulls, terns, herons; concentrations of furbearers (muskrat).

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	8.8	
Ongoing Processes	6.3	
Natural Phenomena	10	
Natural Beauty	5.5	
Biota	10	
Total	40.6 x (Score Index of 1.0) = 40.6	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	10	- Contains evidence from all of the Native periods. Utilized resources include salmon, game and waterfowl, fiddleheads, lithics. Exhibits examples of religious concepts, mortuary practises and has locations that were important to Native culture; Chapel Field, missionaries at St. Annes, church at Aupac, reports of Native burial at St. Annes and the confluence of the Oromocto, 200 Natives buried at or near Savage Island. Played a role in migration patterns, used as a canoe route. In combination with the middle and upper sections of the river was the route between Nova Scotia and Upper Canada, connecting route to the northeastern United States. By linking with other river systems province wide travel was possible. An example of a major meeting place is Savage Island. Other sites of interest include the stockaded Native fort/settlements at Navy Island, and the mouth of the Nerepis.

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
Settlement Patterns	10	- Trading locations or military establishments include Fort LaTour, Partridge Island, Portland, Fort Nashwaak, Fort Jemseg, Fort Nerepis, Fredericton (military depot), Hazen and White's trade store at St. Annes Point, John Anderson's trading establishment at Nashwaak, Benjamin Atherton's store, the trading establishment of Grave at Emenenic, the Saint John City Market, Nid d' Aigle, Fort Howe and Martello Tower. Saint John and Fredericton are settlements that grew in part due to their location on ship and rail transportation routes. Other localities include river boat stops or stagecoach stopovers such as Woodman's Point, Brown's Flats, Evandale, Epworth Park, Day's Landing, Carter's Point, Public Landing and Victoria Beach. Saint John and Fredericton also were industrial or commercial centres. Other examples include Simons, Hazen and White at Saint John and St. Anne, Wm. Davidson's masting operation at Maugerville, shipbuilding at Moss Glen and Portland, skate and carriage factory at Whellpley's. The river was also utilized for natural resource procurement (fish, lumber, fur, quarries). Various cultural groups settled area (15,000 Loyalists in the 1780's, 15,000 Irish in one year in the 1840's), many Scots, disbanded military units, Blacks in the Loyalist period, French during the early historic period, English at Portland and Maugerville, Acadians along the wetlands of the Gagetown area and at St. Annes.

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
Transportation	10	- Important entry/exit point for people and goods between New Brunswick and Europe (Spanish and Portuguese fishermen, Acadian, French, English, Scottish, Irish settlers), transport of supplies, and trade goods (fur, fish, and other natural resources including masts and lumber). Important as a transportation route within New Brunswick for people and goods. Has shipwrecks, and its own distinct vessel type (Saint John River Woodboat, the tow boat and the sloven) stagecoach and riverboat routes and inns, shipbuilding sites. There are many other outstanding transportation related items of historical note that are associated with this section of the river. BETSY, the first ship built in the province - 1769, clipper ship MARCO POLO, the GENERAL SMYTH 3rd steamer in North America were all built at or on the Saint John.
Persons/Concepts	10	- Political movements include the "Smashers" lead by L.A. Wilmont in the 1850's. Old Government House and the Legislative Building at Fredericton have been the seat of power since the 1820's. Development of ethnic cultures or lifestyles reflected by Victorian architectural styles, Loyalist traditions such as farm patterns, Acadian dyking. Some communities exhibit strong ethnic traditions such as Saint John, "the Loyalist City". This section of the river has seen considerable military activity, sites associated with military ventures include: Fort Nashwaak Villebon's base of operations from 1692-1700, battle of Fort Latour, the attack on Caton's Island, expeditions of Church and Moncton 1758, march of the 104th, Saint John during the two World Wars.

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
		Resources include salmon and other fish species, furs, lumber, masts, quarries, agricultural crops.
Rare Finds	10	- The river has archaeological remains from the paleo period to the historic periods, and has seen more or less constant historical utilization since the 1600's. Historic sites include Mount House, the Fredericton Military Compound, structures include Christ Church Cathedral, Government House, Old Arts Building, Belmont House (Lincoln), Martello Tower, County Courthouse -Saint John, riverboat inns and wharves and the many pre-1900 structures. Also included is the Paleo Point from Kingsclear.
Themes in Canadian History	10	- Contains shipbuilding sites at Portland, the site of Fort Latour, Partridge Island for its quarantine station, and the defensive role it played in both World Wars, trading posts sites, the City Market in Saint John.
Summary of Average Human Heritage Scores		
Historical Development	10	
Persons/Concepts	10	
Rare Finds	10	
Themes in Canadian History	10	
Total	40 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 44.4	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	12	- Opportunity for canoeing/kayaking is fair to good. Trips of one to five days are possible; overnight campsites are somewhat regularly dispersed; few or no rapids series exist; portages are possible where necessary. Includes adjustment factor of 2.0.

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
Sport Fishing	7	- Opportunity for fishing is good. Adequate populations of Atlantic salmon, smallmouth bass, brook trout, and other species exist for sport fishing on some sections of the river.
Hunting	3.5	- Opportunity for hunting is good. Adequate populations of large and small game and waterfowl exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	9	- Opportunity for intensive recreation activities is very good to excellent. Many different activities may be carried out along most sections of the river.
Human Heritage Appreciation	10	- Opportunity for human heritage appreciation is excellent. Many active, marked, visible, and invisible sites of both cultural and historical significance exist at several locations along the river.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are varied and/or striking, and several attractive vistas exist. Concentrations of rare plant and animal species are present at several locations. Waterfowl and bird sightings are common.
Solitude/Backcountry	2	- Opportunity to experience solitude/backcountry is poor. Litter, roads, power lines, noise, structures and industry are common, and crowding may occur.
Physical Factors		
Water Flow	9	- Flow of water is excellent. River depth, speed and width is adequate from May to September of every year.

TABLE 4-28 - SAINT JOHN RIVER - LOWER (cont.)

CATEGORY	SCORE	DESCRIPTION
Navigability	9	- Navigability is very good. Obstructions (in the form of rocks, deadheads, weirs, and sandbars) are rare.
Access	9	- Access to river is very good. Access points are frequent for small crafts and occasional for large crafts.
Water Quality	5	- Water quality is adequate. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for land-based activities only.
Shoreline	9	- Shoreline quality is very good to excellent for most or all recreational purposes. Drainage is good, vegetation is light, and slope is gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	7	- Likelihood of negative social/psychological impacts is moderate. Space on the river corridor is adequate, but there exists some possibility of conflict between groups (i.e., powerboats and canoes), especially when crowding occurs.

Summary of Average Recreational Scores

Capabilities	7.5
Impacts/Sensitivities	8
Total	15.5 x (Score Index of 2.5) = 38.8

TABLE 4-29 - SAINT JOHN RIVER - MIDDLE

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the Chaleur Uplands and the New Brunswick Highlands.
Bedrock Geology	9	- Representation of two geologic eras, five periods; Tetagouche and Perham rock groups.
Palaeontology	0	- No fossils identified.
Surficial Geology		
Development	4	- Representation of three stages of surficial development; alluvial, organic, glaciofluvial, and morainal sediments.
Features	7.5	- Fluted bedrock and drumlinoid ridges, eskers, kames or isolated glaciofluvial deposits, meltwater channels, deltas.
Ongoing Processes		
Hydrology	2	- Very large drainage area, relatively large proportion of drainage area as lakes/wetlands; regulated flow.
Water Quality	3.6	- Calcium bicarbonate type; soft water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	9	- Representation of regular, straight and irregular channels; terraces/floodplains; spectacular waterfall, approximately 50 islands, 14 bars, 12 rapids.
Vegetation		
Features	8	- Representation of Saint John River, Restigouche and Magaguadavic ecoregions; organic sediments; moderate extent of wetlands.

TABLE 4-29 - SAINT JOHN RIVER - MIDDLE (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	1	- River environment severely altered by man; settlement, industry, agriculture.
Wildlife	10	- Approximately 35 species of fish; common tern colony at Florenceville (1 of 5 on entire river drainage); Canada goose staging area in spring, Woodstock to Hartland; most mallards in province are seen between Woodstock and Florenceville; a few bald eagle breeding areas.
Natural Phenomena	9	- Falls at mouth of Pokiok River (reduced by Mactaquac headpond); folded Ordovician to Silurian limestone interbedded with shale (Woodstock area); Ordovician iron formation interbedded with volcanic rocks (Temple area); flute casts associated with folded Silurian sandstone and slate (near Kings Landing); river crosses fault at Aroostook, Victoria Corner, Temple; stream piracy (captured headwaters of Restigouche, Miramichi, Nepisiguit); seasonal concentrations of waterfowl and several fish species.
Natural Beauty		
Features	9	- Variety of topography; falls, rapids, islands; highly varied channel pattern, vegetation patterns, and surficial features; many natural phenomena.
Alteration	1	- River environment severely altered by man; settlement, industry, agriculture. Power dam -hydro project.
Biota		
Rare/Endangered	10	- Endangered plant (Pedicularis furbishae); plants otherwise considered rare (Carex plantoginea, Selaginella rupestris, Equisetum variegatum, Lonicera oblongifolia, Juncus brachycephalus, Impatiens pallida, Polygala senega, Solidago spathulata), endangered (Celastrus scandens), and threatened (Woodsia alpina, Aster anticostensis); endangered animal (bald eagle breeding areas).

TABLE 4-29 - SAINT JOHN RIVER - MIDDLE (cont.)

CATEGORY	SCORE	DESCRIPTION
Species Concentrations	8	- Spring-summer runs of Atlantic salmon (large run; predominantly grilse), brook trout, rainbow smelt, alewife, blueback herring, American shad, lamprey; fall run of Atlantic salmon (small run; predominantly grilse); concentrations of migrating/breeding ducks, geese, terns.
Summary of Average Natural Heritage Scores		
Geological Development	5.5	
Ongoing Processes	6.6	
Natural Phenomena	9	
Natural Beauty	5	
Biota	9	
Total	35.1 x (Score Index of 1.0) = 35.1	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	10	- Contains Native sites from late paleo period onward, used for resource procurement (lithics, game). One of the most important Native sites from the contact and historic periods is Meductic. At Meductic were examples of religious and ceremonial beliefs, examples of mortuary practices, the location of important Native events. Possibly pre-contact Native agriculture at this site. Part of several important canoe routes. Meductic, at the end of the Eel River route was a very important meeting place. Meductic contained exceptional artifacts in that the collection covered a range of periods. Several smaller sites, also settlements (Woodstock, mouth of the Tobique, Grand Falls).

TABLE 4-29 - SAINT JOHN RIVER - MIDDLE (cont.)

CATEGORY	SCORE	DESCRIPTION
Settlement Patterns	6	- Settlements grew due to their importance as trading posts (Meductic), military establishments (Grand Falls-1756 temporary French, a 1791 British military post) and as preferred agricultural areas (Hartland, Florenceville, and many smaller communities). Settlements grew due to their location on a transportation route, some becoming commercial or industrial centres (Grand Falls, Aroostook and Perth-Andover, Bristol and Florenceville, Woodstock). Large groups settled the area, especially during the Loyalist period (16 Loyalist regiments). There were also numbers of Irish, Germans, and Scots.
Transportation	3	- Used for transport of goods upstream from Fredericton and Saint John via steamboat service. Other methods included horse drawn tow boats. Carriage works, ferries and the effect of the railway were noted in the historical record.
Persons/Concepts	6	- Ethnic traditions are evident on the river (Loyalist farm patterns, various architectural styles). The practise of religious beliefs began with the Recollect and Jesuit missions at Meductic. Part of this area of the province is still referred to as a Bible Belt. Outstanding individuals include: Morris - 1765, David Ingram's trek -1569, Chief Tobic ca. 1783, John Gyles -1680's.

TABLE 4-29 - SAINT JOHN RIVER - MIDDLE (cont.)

CATEGORY	SCORE	DESCRIPTION
		Special sites along this section of the Saint John include Grand Falls, where Mohawks plunged to their deaths, Meductic and the terminus of the Micmac-Maliseet trail. The march of the 104th through the area is also recognized.
Rare Finds	8	- Known to contain prehistoric sites and historic sites. Over a dozen archaeological sites are recorded along this section. Several structures exist: County Courthouse, Clarke House, Connell House - Woodstock, structures at King's Landing.
Themes in Canadian History	5	- Loyalist and Victorian period structures and other pre-1900 structures fit in this category.
Summary of Average Human Heritage Scores		
Historical Development	6.3	
Persons/Concepts	6	
Rare Finds	8	
Themes in Canadian History	5	
Total	25.3 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 28.5	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	10	- Opportunity for canoeing/kayaking is fair. Trips of one to five days are possible, overnight campsites exist in some areas. Few or no rapids series or portages necessary. Includes adjustment factor of 2.0.
Sport Fishing	5	- Opportunity for fishing is fair to good. Adequate populations of smallmouth bass exist for sport fishing on most sections of the river.

TABLE 4-29 - SAINT JOHN RIVER - MIDDLE (cont.)

CATEGORY	SCORE	DESCRIPTION
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game exist for hunting on most sections of the river. Includes adjustment factor of 0.5.
Intensive Recreation	9	- Opportunity for intensive recreation activities is very good to excellent. Many different activities may be carried out along most sections of the river.
Human Heritage Appreciation	10	- Opportunity for human heritage appreciation is excellent. Many active, marked, visible, and invisible sites of both cultural and historical significance exist at several locations along the river.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are varied and/or striking; concentrations of rare, endangered and threatened plant and animal species are present at several locations; waterfowl and bird sightings are common.
Solitude/Backcountry	2	- Opportunity to experience solitude/backcountry is fair to poor. Litter, roads, power lines, noise, structures and industry are common, and crowding may occur.
Physical Factors		
Water Flow	10	- Water flow is excellent. River depth, speed and width is adequate during a majority of every year.
Navigability	7	- Navigability is good. Obstructions (in the form of rocks, deadheads, weirs, and sandbars) occasionally inhibit passage.
Access	9	- Access to river is very good. Access points are frequent for small crafts and occasional for large crafts.

TABLE 4-29 - SAINT JOHN RIVER - MIDDLE (cont.)

CATEGORY	SCORE	DESCRIPTION
Water Quality	5	- Water quality is fair. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for land-based activities only along some sections of the river.
Shoreline	9	- Shoreline quality is very good to excellent for most recreational purposes. Drainage is good, vegetation is light, and slope is gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	7	- Likelihood of negative social/psychological impacts is moderate to low. Space on the river corridor is adequate, but there exists some possibility of conflict and/or crowding.

Summary of Average Recreational Scores

Capabilities	7.2
Impacts/Sensitivities	8
Total	15.2 x (Score Index of 2.5) = 38

TABLE 4-30 - SAINT JOHN RIVER - UPPER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the Chaleur Uplands.
Bedrock Geology	3	- Representation of one geologic era, three periods.
Palaeontology	0	- No fossils identified.
Surficial Geology		
Development	7	- Representation of five stages of surficial development; alluvial, lacustrine, morainal, glaciofluvial, and pre-quaternary sediments.
Features	5	- Esker, kames or isolated glaciofluvial deposits, meltwater channels.
Ongoing Processes		
Hydrology	2	- Very large drainage area, relatively large proportion of drainage area as lakes/wetlands; regulated flow.
Water Quality	2.7	- Calcium bicarbonate type; soft water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	9	- Representation of straight and irregular, channels; terraces/floodplains; spectacular waterfall, approximately 58 islands, 18 bars, and few rapids.
Vegetation		
Features	5	- Representation of Restigouche ecoregion; some wetlands.
Alteration	1	- River environment severely altered by man; settlement, agriculture, industry, forestry.

TABLE 4-30 - SAINT JOHN RIVER - UPPER (cont.)

CATEGORY	SCORE	DESCRIPTION
Wildlife	10	- Approximately 25 species of fish; used by breeding and migrating waterfowl throughout; common tern colony at St. Claire (one of 5 on the entire river drainage); possibly a small black-crowned night heron colony on this segment of river; habitat of fathead minnow, represents eastern Canadian limit.
Natural Phenomena	8	- Grands Falls (approximately 25 m; gorge with sheer cliffs more than 30 m high; large potholes in floor of gorge); Devonian siltstone interbedded with slate (Edmundston); stream piracy (captured headwaters of Restigouche); seasonal concentrations of waterfowl.
Natural Beauty		
Features	9	- Variety of topography; falls, rapids, islands, varied channel pattern and surficial features; superior viewing opportunities; many natural phenomena.
Alteration	1	- River environment severely altered by man; settlement, agriculture, industry, forestry.
Biota		
Rare/Endangered	9	- Endangered plant (Pedicularis furbishae); plants otherwise considered rare (Allium canadense) and endangered (Carex josselynii); eastern Canadian limit of fathead minnow, provincially rare.
Species Concentrations	4	- Concentrations of breeding and migrating waterfowl; common tern colony at St. Clair; black-crowned night heron colony believed to be on this section of river.

TABLE 4-30 - SAINT JOHN RIVER - UPPER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	3	
Ongoing Processes	6.1	
Natural Phenomena	8	
Natural Beauty	5	
Biota	6.5	
Total	28.6 x (Score Index of 1.0) = 28.6	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	9	- Contains an archaic site at Quisibis, ceramic, contact and historic period sites; the reported burial site below the mouth of the Madawaska represents ceremonial concepts and mortuary practises.
Settlement Patterns	6	- Contained a trade location and military post (Edmundston), and was the location where Acadians were resettled in the 1780's (Madawaska). Madawaska was also known as a meeting location, with several commercial ventures, particularly at Edmundston.
Transportation	3	- The river environment played a role in the transport of people and goods within the province and was on several, railway lines; Terminus of St. Francis, Temiscouata, CPR.
Persons/Concepts	5	- Associated with political movements: Aroostook War, and other boundary disputes, also with Acadian resettlement.
Rare Finds	5	- There are several examples of prehistoric sites.
Themes in Canadian History	2	- There are examples of sites that are representative of themes in Canadian history (Aroostook War and border disputes).

TABLE 4-30 - SAINT JOHN RIVER - UPPER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Human Heritage Scores		
Historical Development	6	
Persons/Concepts	5	
Rare Finds	5	
Themes in Canadian History	2	
Total	18 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 20.3	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	14	- Opportunity for canoeing/kayaking is good. Trips of three to five days are possible; overnight campsites are somewhat regular; rapids series challenge intermediate canoeists; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	5	- Opportunity for fishing is fair. A variety of sport fish species exist, but population sizes are not known.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreational use is good. Several different land-based activities and some water-based activities may be carried out along the length of the river.
Human Heritage Appreciation	7	- Opportunity for human/cultural heritage appreciation is good. Several active sites and invisible (archaeological) sites of significance exist along the river.

TABLE 4-30 - SAINT JOHN RIVER - UPPER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Unique and/or attractive vistas can be found; concentrations of rare and endangered plant and animal species are present at some locations; waterfowl and bird sightings are common.
Solitude/Backcountry	3	- Opportunity to experience solitude/backcountry is fair. Litter, roads, power lines, noise, structures and industry are all present.
Physical Factors		
Water Flow	9	- Water flow is excellent. River depth, speed and width is adequate from May to September of every year.
Navigability	9	- Navigability is excellent. Obstructions (i.e., hydro dam, impoundment) are rare and do not hinder navigability.
Access	7	- Access to river is good. Access points are frequent for small crafts but rare for larger crafts.
Water Quality	10	- Water quality is very good. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for land- and water-based activities.
Shoreline	3	- Shoreline quality is poor for most recreational purposes. Drainage is good; vegetation is light; slope is very steep.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.

TABLE 4-30 - SAINT JOHN RIVER - UPPER (cont.)

CATEGORY	SCORE	DESCRIPTION
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate, and there exists little possibility of conflict and/or crowding.

Summary of Average Recreational Scores

Capabilities	7
Impacts/Sensitivities	9
Total	16 x (Score Index of 2.5) = 40

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	10	- Flows through the Chaleur Uplands, New Brunswick Highlands, and the Maritime Plain.
Bedrock Geology	6	- Representation of one geologic era, five periods; Kingsclear, Tetagouche, and Tobique rock groups.
Palaeontology	2.5	- Unspecified plant fossils.
Surficial Geology		
Development	8	- Representation of five stages of surficial development; alluvial, organic, lacustrine, marine, glaciofluvial, morainal, and pre-quaternary sediments.
Features	5	- Fluted bedrock and drumlinoid ridges, kames or isolated glaciofluvial deposits, meltwater channels, beach ridge.
Ongoing Processes		
Hydrology	10	- Large drainage area, excellent representation of lakes/wetlands within drainage area; excellent representation of variable hydrologic conditions approximately 23% of length is tidal.
Water Quality	3	- Calcium bicarbonate type; very soft to soft water; some variation of natural water quality. Includes adjustment factor of 1.0.
Morphology	8	- Representation of straight and irregular channels, irregular meanders terraces/floodplains; approximately 21 rapids, 178 islands, and 17 bars.

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Vegetation		
Features	8	- Representation of Maritime Uplands and Maritime Lowlands ecoregions; organic sediments; moderate extent of wetlands.
Alteration	7	- River environment altered somewhat by man; settlement, agriculture, industry, forestry.
Wildlife	9	- Approximately 30 species of fish; significant deer wintering area near Holtville, 400-500 deer; bald eagle breeding area near mouth.
Natural Phenomena	10	- Thin bed of coal in grey Carboniferous sandstone at mouth of Burnt Land Brook; lense of thick, cross-bedded, grey Carboniferous sandstone separated by thin shale beds (Doaktown); crosses fault above Juniper, below Rocky Brook, Newcastle; stream piracy (captured headwaters of streams in area such as Taxis); valley attributed to synclinal depression and Appalachian trough; tributaries with waterfalls near mouth (Falls Brook, approximately 30 m; Trout Brook, approximately 15 m to basin and then another 13 m drop); excellent seasonal concentrations of many fish species and white-tailed deer; fossils present.
Natural Beauty		
Features	10	- Variety of topography and land-water relations; many islands and rapids; highly distinguishable landforms/landscape; many natural phenomena; highly varied channel patterns.
Alteration	7	- River environment altered somewhat by man; settlement, agriculture, industry, forestry.

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Biota		
Rare/Endangered	9	- Endangered animal (bald eagle breeding area); plants considered rare (*Agalinus parviflora*, *Cuscuta pentagona*, *Podostemum ceratophylum*, *Montia fontana*, *Samolus valerandi* spp. *parviflorus*, *Sagittaria calycina* var. *spongiosa*).
Species Concentrations	6	- Spring-summer runs of brook trout, lamprey, American shad, striped bass, rainbow smelt, alewife, blueback herring, Atlantic salmon (large run; predominantly grilse); fall run of Atlantic salmon (small run; predominantly grilse); concentrations of wintering white-tailed deer (400-500 near Holtville).
Summary of Average Natural Heritage Scores		
Geological Development	6.3	
Ongoing Processes	7.8	
Natural Phenomena	10	
Natural Beauty	8.5	
Biota	7.5	
Total	40.1 (Score Index of 1.0) = 40.1	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	9	- Important prehistorically, contains sites from the archaic period onward, important transportation route, abundance of natural resources (salmon, game, fowl, lithics). Ceremonial concepts, mortuary practises, and exceptional lithics from the archaic period exhibited at Gerrish Site, copper kettle burial mouth of Bartibog also exhibits mortuary practices.

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
		A very important canoe route, allowed access to the interior, and connected the Miramichi and the Saint John river systems. Possibly settlements at the mouth of the Clearwater, and Renous. Predictive potential is good, as only sections have been investigated archaeologically.
Settlement Patterns	10	- Examples of trading locations include Denys' establishment at the confluence of the Northwest-1688, Davidson's establishment at Miramichi Point and at Elmtree, Cort's house and store at the 'forks of the river'-1770-80's, military establishments include the establishment of Denys, the Battery on the east side of Beaubear's Island, battery at French Fort Cove, Banks were preferred agricultural areas, settlements grew at the junction of transportation routes (Miramichi Point, Beaubear's Island, Blackville, Renous), and the river has at least two major commercial/business centres (Newcastle and Chatham). Several groups from different periods settled the Southwest banks (French -i.e., Denys - 1680's, Acadian refugees at Beaubear's Island and Miramichi Point-ca.1755, English immigrants, the Davidson 'Family' -Late 1700's, Loyalists -1780's, Scots from the highland clearances, disbanded military units -Black Watch, Irish-1823, 85, 86). Military activity includes Wolfe's destruction of Acadian settlements, Murry's punitive attack on French and Acadian settlements - 1758, American privateers pillage Native, French, Acadian, and Davidson's settlements 1690-1777.

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
		Resources include salmon, furs, forest products.
Transportation	9	- The Miramichi was one of the main rivers in the link between Europe and the province (Newcastle, Chatham). From these ports, and Miramichi Point goods were transported to the interior (fur trade, supplies from Europe). Natural resources of the area were loaded on ocean-going vessels. The Miramichi has a long shipbuilding record (THE MIRAMICHI, 300t. built by Wm. Davidson in 1773, the province's second ship). Settlements developed as a result of being the terminus of a ship route (Miramichi Point, Newcastle and Chatham). Newcastle and Chatham, in particular, profited from supplying and housing the machinery or individuals travelling or working on the ships. Although there are no known shipwrecks in the study area there is THE HULTON in Miramichi Bay. This wreck has been designated as a protected Provincial Historic Site. Because the river has otherwise scored so high, this site is included so that a value in keeping with the Miramichi's Human Heritage could be assigned.
Persons/Concepts	9	- Evidence of development of ethnic traditions includes Acadians at Miramichi Point, Irish Folk Festival, Miramichi folk songs and agricultural patterns. Development and early practise of religious beliefs represented at Denys' fortified post which contained a Mission -1688, Mission east of Miramichi Point, First Presbyterian Church on the Miramichi-1791 at Wilson's Point).

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
		Individuals, groups, events and places include Fronsac and his trading post; captive John Witherspoon-1757; 'Elmtree' -the first British settlement on the Miramichi; the first fishing station, 1780's; gravesite of Wm. Davidson at Miramichi Point -1790; Miramichi Fire -1824, shipbuilding; Miramichi sandstone used for structures on Parliament Hill-1884; first meeting of Justices of the Peace on the Miramichi at Beaubear's Island -1789; Fighting Election of 1843. Champlain and Cartier visit in 1534, Boishebert; James John Fraser - Premier 1878-82, Lieutenant Governor 1893; Lord Beaverbrook British Minister of Information.
Rare Finds	8	- Miramichi Point-Acadian settlement, defences, burials, Scottish settlement, and commercial interests, burial, associated church, Elmtree, shipbuilding sites on Beaubear's island, historic structures such as MacDonald Farm, Beaverbrook's home, the Gerrish archaic burial, the Bartibog copper kettle burials, the Girouard shipwreck site.
Themes in Canadian History	5	- Middle Island, Victorian period houses, shipbuilding sites, the site of Elmtree representing the ambition of New Brunswick's early settlers.

Summary of Average Human Heritage Score

Historical Development	9.3
Persons/Concepts	9
Rare Finds	8
Themes in Canadian History	5
Total	31.3 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 35.3

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	16	- Opportunity for canoeing/kayaking is good. Trips of 5 or more days are possible; potential campsites are dispersed at regular to somewhat regular intervals; class II to III rapids sequences challenge most canoeists; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	9	- Opportunity for fishing is excellent. Adequate populations of Atlantic salmon and brook trout exist for sport fishing along the length of the river.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. A variety of land- and water-based activities may be carried out along most of the river.
Human Heritage Appreciation	10	- Opportunity for human heritage appreciation is excellent. Three museums, several marked sites, and many pre-1900 structures, historic and prehistoric sites can be found along the river.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is good to very good. Rare plant species can be found along the river; sightings of deer and moose are common; and several attractive vistas, waterfalls and rapids can be found.

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Solitude/Backcountry	6	- Opportunity to experience solitude/backcountry is moderate. Structures, industry, power lines, roads, noise, and pollution are all present although roads are only visible occasionally, and pollution and industry are concentrated around the larger towns. Depending on the time of year, contact with other people varies from low to high (lowest in spring).
Physical Factors		
Water Flow	7	- Water flow is fair to good. River depth, speed and width is adequate during the spring and fall of every year.
Navigability	7	- Navigability is very good to excellent. Gravel bars and rock obstructions occur occasionally, but do not limit navigability significantly; other obstacles occur infrequently.
Access	7	- Access to river is very good. Points of access are frequent for small crafts and occasional (centred around Newcastle) for larger crafts.
Water Quality	5	- Water quality is fair. Appearance with respect to color, odor, aquatic vegetation, and presence of solid waste along most of the river is acceptable for both land- and water-based activities. However, water may not be suitable for water based activities around the Newcastle area.
Shoreline	7	- Shoreline quality is adequate for most or all recreational purposes. Terrain is suitable for parking, beaches, camping, and trails. Drainage is good; vegetation is dense; and slope is steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.

TABLE 4-31 - SOUTHWEST MIRAMICHI RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Social/Psychological Impacts	7	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is generally adequate but there is some potential for conflict between anglers and canoeists.

Summary of Average Recreational Scores	
Capabilities	7.6
Impacts/Sensitivities	8
Total	15.6 x (Score Index of 2.5) = 39

TABLE 4-32 - TETAGOUCHE RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	3	- Flows within the New Brunswick Highlands.
Bedrock Geology	6	- Representation of one geologic era, four periods; Chaleur and Tetagouche rock groups, Bonaventure and Bathurst formations.
Palaeontology	5	- Graptolites, brachiopods.
Surficial Geology		
Development	4	- Representation of three stages of surficial development; marine, glaciofluvial, morainal, and pre-quaternary sediments.
Features	7.5	- Moraine ridges, esker, kames or isolated glaciofluvial deposits, meltwater channels, beach ridge.
Ongoing Processes		
Hydrology	5	- Good representation of natural hydrologic characteristics of rivers in drainage region; approximately 4% of length is tidal.
Water Quality	2.7	- Calcium bicarbonate type; soft water; some variation of natural water quality. Includes adjustment factor of 0.9.
Morphology	9	- Representation of irregular channels and irregular meanders; approximately 2 waterfalls, 3 rapids, 15 islands, and 4 bars.
Vegetation		
Features	1	- Representation of Restigouche and New Brunswick Highlands ecoregions.
Alteration	8	- River environment altered somewhat by man; settlement, forestry.
Wildlife	6	- Approximately 10 species of fish.

TABLE 4-32 - TETAGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Natural Phenomena	8	- Tetagouche Falls (Ordovician ferromanganiferous slate interbedded with volcanic tuff is exposed); seasonal concentrations of white-tailed deer and several fish species; fossils present; geological formations.
Natural Beauty		
Features	9	- Variety of vegetation patterns, channel patterns and surficial features; two falls, rapids, and several islands, several natural phenomena.
Alteration	8	- River environment altered somewhat by man; settlement, forestry.
Biota		
Rare/Endangered	5	- Plants considered rare (Aster subulatus var. obtusifolius) and threatened (Polygonum caurianum spp. hudsonianum).
Species Concentrations	3	- Spring-summer runs of rainbow smelt, lamprey, brook trout; fall run of Atlantic salmon (large run; predominantly large salmon); concentrations of wintering white-tailed deer.
Summary of Average Natural Heritage Scores		
Geological Development	5	
Ongoing Processes	5.9	
Natural Phenomena	8	
Natural Beauty	8.5	
Biota	4	
Total	31.4 x (Score Index of 1.0) = 31.4	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	1	- Very little archaeological work has been carried out on this river.

TABLE 4-32 - TETAGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Settlement Patterns	6	- Settlements developed around trading and military establishments at the mouth (N. Denys' fortified trading post as Ferguson Point -1644-52, later run by his son, also the establishment of Commodore Walker at Alston Point). A number of French (Denys) settled the area as well as Acadians. Early businesses include those of the Denys.
Transportation	1	- Not important for transport of goods.
Persons/Concepts	5	- Several individuals/places that stand out; Nicholas Denys, Richard Denys, Walker, Le Clerq; the site of the Jesuit mission at Ferguson Point, the burial spots of N. Denys, priests, and a French admiral.
Rare Finds	1	- Probably contains isolated finds.
Themes in Canadian History	4	- Represented by the establishment of the Denys and the Jesuit mission.
Summary of Average Human Heritage Scores		
Historical Development	2.7	
Persons/Concepts	5	
Rare Finds	1	
Themes in Canadian History	4	
Total	12.7 x (Human Heritage Adjustment Factor of 0.8) x (Score Index of 1.25) = 12.8	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	6	- Opportunity for canoeing/kayaking is fair. Only short stretches of the river are suitable for canoeing and overnight trips are not appropriate. Potential campsites are dispersed at somewhat regular intervals; some class III

TABLE 4-32 - TETAGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
		rapids sequences are only suitable for advanced canoeists; portages are not necessary. Includes adjustment factor of 2.0.
Sport Fishing	7	- Opportunity for fishing is good. Adequate populations of Atlantic salmon and brook trout exist for sport fishing along most sections of the river.
Hunting	2.5	- Opportunity for hunting is fair. Adequate but decreasing populations of white-tailed deer and adequate populations of bear and small game exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	7	- Opportunity for intensive recreation activities is good. A variety of land- and a few water-based activities may be carried out.
Human Heritage Appreciation	7	- Opportunity for human heritage appreciation is moderate to good. At least two active sites and several pre-1900 structures can be found along the river.
Natural Values		
Natural Attractions	7	- Opportunity for appreciation of scenic beauty is good. Rare and threatened plant species can be found along the river; animal sightings are common; and attractive vistas, waterfalls and rapids can be found.
Solitude/Backcountry	6	- Opportunity to experience solitude/backcountry is moderate. Structures, industry, power lines, roads, noise, and pollution are all present but concentrated near the mouth of the river. Depending on the season and section of the river, contact with other people varies from low to medium.

TABLE 4-32 - TETAGOUCHE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Physical Factors		
Water Flow	5	- Water flow is fair. River depth, speed and width is usually adequate during one or two months in the spring of most years.
Navigability	9	- Navigability is very good to excellent. Obstructions in the form of sandbars occur rarely, and do not limit navigability significantly.
Access	3	- Access to river is poor. Points of access are rare for small crafts and non-existent for larger crafts.
Water Quality	10	- Water quality is good. Appearance with respect to color, odor, aquatic vegetation, and presence of solid waste along the river is acceptable for both land- and water-based activities.
Shoreline	4	- Shoreline quality is fair for some recreational purposes. Terrain is suitable for parking, camping, and trails. Drainage is excellent; vegetation is dense to light; and slope is steep.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate, and there is little likelihood of potential conflict between groups.

Summary of Average Recreational Scores

Capabilities	5.9
Impacts/Sensitivities	9.0
Total	14.9 x (Score Index of 2.5) = 37.3

TABLE 4-33 - TOBIQUE RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGES VALUES		
Geological Development		
Physiography	7	- Flows through the Chaleur Uplands and the New Brunswick Highlands.
Bedrock Geology	6	- Representation of one geologic era, four periods; Tobique, Perham, and Matapedia rock groups, Wapske formation.
Palaeontology	2.5	- Brachiopods.
Surficial Geology		
Development	5	- Representation of four stages of surficial development; alluvial, morainal, glaciofluvial, and pre-quaternary sediments.
Features	7.5	- Eskers, kames, or isolated glaciofluvial deposits, meltwater channels, delta, sink hole.
Ongoing Processes		
Hydrology	2	- Large drainage area, very good representation of hydrologic characteristics of rivers in the drainage region; regulated flow.
Water Quality	3	- Calcium bicarbonate type; soft water; some variation of natural water quality. Includes adjustment factor of 1.0.
Morphology	8	- Representation of straight and irregular channels, irregular and tortuous meanders; terraces/floodplains; approximately 10 rapids, 78 islands, 2 bars, and 8 oxbows/associated features.
Vegetation		
Features	8	- Representation of Saint John River, Restigouche, Maritime Uplands, and New Brunswick Highlands ecoregions; some wetlands; unique ecosystem (Blue Mountain red pine stand).

TABLE 4-33 - TOBIQUE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	6	- River environment altered somewhat by man; settlement, agriculture, industry, forestry.
Wildlife	9	- Approximately 15 species of fish; several significant deer wintering areas (200-300 deer each); wintering bald eagles on lower stretch.
Natural Phenomena	8	- Folded Devonian sandstone and shale (Arthurette), Carboniferous gypsum deposits (Plaster Rock area); river encounters and follows fault at Tobique Narrows, along Little Tobique River; very steep valley, cliffs; numerous oxbow lakes/features; seasonal concentrations of white-tailed deer and several fish species; fossils present; geological formation.
Natural Beauty		
Features	9	- Highly varied vegetation patterns, channel patterns, and surficial features; many islands and rapids; several natural phenomena.
Alteration	6	- River environment altered somewhat by man; settlement, agriculture, industry, forestry.
Biota		
Rare/Endangered	9	- Endangered animal (wintering bald eagles), plants considered threatened (Carex concinna) and endangered (Astragalus robbinsii var. fernaldii).
Species Concentrations	2	- Spring-summer runs of lamprey, Atlantic salmon (large run; predominantly grilse); fall run of Atlantic salmon (small run; predominantly grilse); concentrations of wintering white-tailed deer.

TABLE 4-33 - TOBIQUE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	5.5	
Ongoing Processes	6.6	
Natural Phenomena	8	
Natural Beauty	7.5	
Biota	5.5	
Total	33.1 (Score Index of 1.0) = 33.1	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	6	- Contains Native sites from the archaic, ceramic and historic periods; used as a canoe route locally and for access to the Upsalquitch, the Little Southwest Miramichi, and the Nepisiguit. Good potential for undiscovered archaeological sites.
Settlement Patterns	3	- Settled basically because of its natural resources (forest products).
Transportation	1	- Relative to the rest of the province not particulary important for transportation, other than localized transport or access to other river systems.
Persons/Concepts	2	- Outstanding individuals include J.B. McNair, former premier of the province, Donald Fraser (Fraser Mills). Local legend claims that Birch Ridge is the burial spot for one of Jesse James' gang.
Rare Finds	6	- Deadman's Pool and many other prehistoric sites.
Themes in Canadian History	1	- No sites were identified.

TABLE 4-33 - TOBIQUE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Human Heritage Scores		
Historical Development	3.3	
Persons/Concepts	2	
Rare Finds	6	
Themes in Canadian History	1	
Total	12.3 x (Human Heritage Adjustment Factor of 0.9) x (Score Index of 1.25) = 13.9	
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	16	- Opportunity for canoeing/kayaking is good to very good. Trips of five or more days are possible; camp sites are regularly dispersed; moving water on some sections challenges novice and intermediate paddlers; short portages, poling or lining are occasionally necessary. Includes adjustment factor of 2.0.
Sport Fishing	9	- Opportunity for fishing is very good. Adequate populations of Atlantic salmon, brook trout, or smallmouth bass exist along the length of the river.
Hunting	4.5	- Opportunity for hunting is very good. Adequate populations of large and small game and some water fowl exist for hunting along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	8	- Opportunity for intensive recreation activities is good to very good. Many different land-based activities and some water-based activities may be carried out.

TABLE 4-33 - TOBIQUE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Human Heritage Appreciation	3	- Opportunity for human heritage appreciation is fair to poor. No active sites and only a few marked sites (century farms) are present; several archaeological sites exist.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is very good. Landforms are unique and varied; deer sightings are common in some areas; rare, endangered, and threatened species of flora and fauna can be found; some areas of exceptional beauty are present.
Solitude/Backcountry	3	- Opportunity to experience solitude/backcountry is fair to poor. Litter, roads, power lines, noise, etc. are all present; structures are both industrial and rural in nature; contact with other people is likely, occasional crowding can occur.
Physical Factors		
Water Flow	5	- Water flow is fair. River depth, speed and width is adequate during May and June of most years.
Navigability	7	- Navigability is good. Obstructions are present but rare on most sections of the river and do not significantly hinder navigability.
Access	7	- Access to the river is good. Frequent access points exist for small crafts along most sections of the river, but access for larger crafts is concentrated in the headpond area.
Water Quality	10	- Water quality is very good. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both land- and water-based activities.

TABLE 4-33 - TOBIQUE RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Shoreline	5	- Shoreline quality is fair for some recreational purposes. Terrain is usually suitable for parking, trails, camping, and beaches. Drainage is good on some sections of the river; vegetation is usually light; slope varies from steep to gentle.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	9	- Likelihood of negative social/psychological impacts is low. Space on the river corridor is adequate and there is little likelihood of conflict between groups.

Summary of Average Recreational Scores

Capabilities	6.9
Impacts/Sensitivities	9
Total	15.9 x (Score Index of 2.5) = 39.8

TABLE 4-34 - UPSALQUITCH RIVER

CATEGORY	SCORE	DESCRIPTION
NATURAL HERITAGE VALUES		
Geological Development		
Physiography	7	- Flows through the New Brunswick Highlands and the Chaleur Uplands.
Bedrock Geology	4	- Representation of one geologic era, three periods; Matapedia, Grog Brook, Chaleur, Dalhousie, and Tetagouche rock groups, Campbellton formation.
Palaeontology	5	- Brachiopods, corals, trilobites, bryozoans, molluscs.
Surficial Geology		
Development	3	- Representation of three stages of surficial development; alluvial, morainal, and pre-quaternary sediments.
Features	2.5	- Moraine ridge, meltwater channel.
Ongoing Processes		
Hydrology	8	- Very good representation of natural hydrologic characteristics of large rivers in drainage region, very good representation of variable hydrologic conditions.
Water Quality	5	- Calcium bicarbonate type; moderately hard water; large variation of natural water quality. Includes adjustment factor of 1.0.
Morphology	10	- Representation of irregular channels and irregular meander; terraces/floodplains; approximately 4 waterfalls, 3 rapids, 39 islands, and 26 bars.
Vegetation		
Features	4	- Representation of Restigouche and Maritime Uplands ecoregions; unique ecosystem (Upsalquitch River mixed pine stand).

TABLE 4-34 - UPSALQUITCH RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Alteration	8	- River environment altered somewhat by man; settlement, forestry.
Wildlife	7	- Approximately 12 species of fish; several major deer wintering areas at head of river of significance.
Natural Phenomena	8	- North-flowing river (rare in N.B.), pre-glacial channel, ancient river; Great Falls; flows over 3 dykes below Great Falls, high terraces; excellent seasonal concentrations of white-tailed deer and several fish species; fossils present; geological formation.
Natural Beauty		
Features	9	- Variety of topography, channel patterns, and vegetation patterns; several distinguishable landforms/landscape; four waterfalls, many islands, and rapids, several natural phenomena.
Alteration	8	- River environment altered somewhat by man; settlement, forestry.
Biota		
Rare/Endangered	6	- Plants considered rare (Carex livida var. radicaulis, Goodyera oblongifolia).
Species Concentrations	2	- Spring-summer runs of lamprey, brook trout, Atlantic salmon (large run; predominantly grilse); fall run of Atlantic salmon (small run; predominantly grilse); concentrations of wintering white-tailed deer.

TABLE 4-34 - UPSALQUITCH RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Natural Heritage Scores		
Geological Development	4.7	
Ongoing Processes	7.4	
Natural Phenomena	8	
Natural Beauty	8.5	
Biota	4	
Total	32.6 x (Score Index of 1.0) = 32.6	
HUMAN HERITAGE VALUES		
Historical Development		
Native People	2	- Based on historical documentation the river was utilized by Native groups as a canoe route connecting various river systems.
Settlement Patterns	1	- Settlements not known to have developed for military or agricultural reasons, or resource utilization. Not an entry-exit or settling point.
Transportation	1	- Not important for transportation.
Persons/Concepts	1	- Not known for development of political movements, ethnic traditions, no outstanding individuals.
Rare Finds	1	- May contain isolated finds.
Themes in Canadian History	1	- No sites known.
Summary of Average Human Heritage Scores		
Historical Development	1.3	
Persons/Concepts	1	
Rare Finds	1	
Themes in Canadian History	1	
Total	4.3 x (Human Heritage Adjustment Factor of 1.0) x (Score Index of 1.25) = 5.4	

TABLE 4-34 - UPSALQUITCH RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
RECREATIONAL VALUES		
Capabilities		
Range of Appropriate Activities		
Canoeing-Kayaking	8	- Opportunity for canoeing/kayaking is fair. Some parts of the river allow short trips for beginner and intermediate paddlers. Occasional, undeveloped campsites are available, portaging is not necessary. Includes adjustment factor of 2.0.
Sport Fishing	7	- Opportunity for fishing is moderate to good. Atlantic salmon is stocked and an adequate population exists for sport fishing on some sections of the river.
Hunting	4.5	- Opportunity for hunting is good. Adequate populations of large and small game exist along the length of the river. Includes adjustment factor of 0.5.
Intensive Recreation	5	- Opportunity for intensive recreation activities is fair. A few land- and water-based activities may be carried out on some stretches of the river.
Human Heritage Appreciation	3	- Opportunity for human heritage appreciation is fair to poor. A few pre-1900 structures are visible near the mouth of the river.
Natural Values		
Natural Attractions	9	- Opportunity for appreciation of scenic beauty is good. Terrain is varied; rare plant species and many significant deer wintering areas exist along the river.

TABLE 4-34 - UPSALQUITCH RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Solitude/Backcountry	7	- Opportunity to experience solitude/backcountry is good. Power lines, buildings, litter, roads, etc. exist but are concentrated around the community of Upsalquitch. Chance of human contact is low to moderate.
Physical Factors		
Water Flow	7	- Water flow is fair to good. River depth, speed, and width is adequate for navigation during the spring and fall seasons of every year.
Navigability	8	- Navigability is good to very good. Rocks and sand bars are frequent but do not interfere significantly with river travel.
Access	3	- Access to river is poor. Access and launching points are rarely available except around the mouth of the river.
Water Quality	10	- Water quality is excellent. Appearance with respect to color, odor, aquatic vegetation, turbidity, and presence of solid waste is acceptable for both contact and non-contact water-based activities.
Shoreline	5	- Shoreline quality is acceptable for some recreational purposes. Terrain is suitable for parking and potentially for trails and camping. Drainage is good, vegetation is dense, and slope is varied.
Impacts/Sensitivities		
Physical/Ecological Impacts	9	- Potential for physical/ecological impacts as a result of recreational use is low.
Social/Psychological Impacts	5	- Potential exists for negative social/psychological impacts. There is some chance of conflict between anglers and canoeists.

TABLE 4-34 - UPSALQUITCH RIVER (cont.)

CATEGORY	SCORE	DESCRIPTION
Summary of Average Recreational Scores		
Capabilities	6.1	
Impacts/Sensitivities	7	
Total	13.1 x (Score Index of 2.5) = 32.8	

5.0 RIVER MANAGEMENT CONSIDERATIONS

5.1 Introduction

This section provides background information as the setting within which management feasibility can be analyzed. It first presents the national structure for the CHRS with respect to overall management and administration. This is followed by an overview of the federal and provincial legislation and regulatory tools which could pertain to the management of heritage rivers in New Brunswick. It then presents a description of possible options which could be considered to manage heritage rivers in a New Brunswick context.

The following description of the national structure of the CHRS has been derived from CHRS brochures and promotional information.

5.2 National Structure

The CHRS is a cooperative program, developed and run by the parks administrations of territorial, provincial and the federal governments to give national recognition to the important rivers of Canada. On January 18, 1984, the Canadian Heritage Rivers Board was formally established to administer the CHRS program and review river nominations. A small Secretariat was also created within the Canadian Parks Service to provide administrative support and technical assistance to the Board in implementing the program and to help publicize the system.

The Board recommends to the federal Environment Minister, and the provincial and territorial Minister(s) of the nominating government(s), whether nominated rivers meet the selection guidelines for the system and thus should be designated Canadian Heritage Rivers. The Board currently is comprised of 12 members, two appointed by the federal government and one appointed by each of the 8 provincial and 2 territorial governments that have chosen to participate in the CHRS to date. The federal representatives are from Department of Environment-Parks and the Department of Indian and Northern Affairs while the eight provinces represented are Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and Saskatchewan.

A fundamental principal of the CHRS is that the nomination and management of Canadian Heritage Rivers remains with the level of government presently responsible. This is generally the provincial governments in the south, the federal government in national parks and on other federal lands, and the federal and territorial governments jointly in the north. Nomination of rivers to the CHRS may be made only by participating governments with jurisdiction over the land and water being nominated; however, private citizens or groups may present submissions to their provincial or territorial parks agency concerning any rivers which they feel worthy of consideration based on their natural, historical or recreational value.

Following acceptance as a candidate river, the responsible provincial, territorial or federal government agency(s) have three years in which to prepare a management plan outlining the measures to be taken to conserve and develop the waterway.

On receipt of the management plan, the Board then recommends to the Ministers that the river be officially designated as a Canadian Heritage River. Ownership does not change hands, but rather stays with the nominating government with jurisdiction over the nominated area.

As of February, 1990, more than 4,000 km of 18 rivers have been nominated to the CHRS. Nine of the eighteen nominated rivers have so far been designated, meaning that management plans for the rivers have been lodged with the CHRS Board and the rivers have been formally accepted into the system.

5.3 Regulatory Tools For Heritage River Management

5.3.1 General Policy Related To Water Management

No one department or agency, either federal or provincial has a clear mandate to manage rivers and their associated resources, nor is there an act which relates to management of all types of rivers and their associated resources. There are several agencies or departments which manage resources directly associated with rivers, while other agencies, in fulfilling their mandate, may indirectly affect the management of rivers and their resources.

A previous study of New Brunswick Wetlands (Montreal Engineering Company Ltd., 1979) identified the status of federal and provincial (New Brunswick) legislation pertaining specifically to the management of wetlands. Much of this information is also relevant to river and water management in general. That study was reviewed and the information was updated through review of current acts as well as discussions with officials of the particular departments responsible for the administration of some of the more relevant acts. This updated information is presented in the remainder of this section.

The legislative power in Canada is divided between the federal and provincial governments. The basis for this division lies in the British North America (BNA) Act of 1867 which established the division between federal and provincial authority. The major purpose of the Act was to divide between the two levels of government, the power to make new laws. The areas of jurisdiction overlap to a considerable degree and on many subjects both the federal parliament and the province may legislate.

The New Brunswick wetlands study identified the principal bases for federal legislative power over water management. These include (from the BNA Act):

Section 91	Peace, Order and Good Government. This has been employed to extend federal control to such interprovincial concerns as radio and aeronautics. It has also served as the basis for jurisdiction over offshore mineral rights and may be the basis for international water agreement. If a health crisis arose due to water pollution, etc., this would allow the Federal Government to act.

Section 91 (10)	Navigation and Shipping authorizes the Federal Government to regulate navigation and shipping in a very broad way, including the power to regulate navigation, to improve the navigability of water and to prevent the erection of works that might impede navigation.
Section 91 (12)	Sea Coast and Inland Fisheries gives the Federal Government general power to regulate fishing including the establishment of licensing schemes and closed seasons and making provision for the preservation of fisheries. This section gives the Federal Government legislative power, not property rights. The provinces then can legislate on property rights which may carry with them the right to fishing. Provinces may enact legislation regulating fishing on the lands. Provincial rights may extend into the tidal waters, for example leasing oyster beds.
Section 91 (24)	Gives the Federal Government power to administer Indian lands, most of which include water resources.
Section 91 (29) and 92 (10)	Extraprovincial works and undertakings connecting the province with other provinces or extending beyond the limits of a province that is within the federal legislative power.

Section 95	Agriculture, gives the Federal Government and the provinces concurrent power over agriculture. It would appear to concern agricultural operations, as well as irrigation and wetland reclamation for agricultural purposes.
Section 92 (13) and (16)	Basis of provincial powers lie in the rights of the provinces to legislate respecting property and civil rights in the province and matters of a local or private nature. The province may exercise jurisdiction over water supply, power development, water conservation, food control, pollution and recreation.
Section 95 (5)	Gives the provinces power over the management and sale of public lands.

The 1988 Discussion Paper on Water Management Issues and A Clean Water Act (Department of Municipal Affairs and Environment) stated that the Federal Government's "Inquiry on Federal Water Policy" found that the division of jurisdictional authority over water in Canada sometimes gives rise to tensions between the federal and provincial governments. Under any interpretation of Canada's Constitution, the provinces have wide jurisdiction over water even though water is not mentioned in the Constitution. Nevertheless, the provinces "own" natural resources, hence the water within their boundaries. Competence to legislate water matters derives from the provinces' jurisdiction over the management of public lands, over property and civil rights, and over matters of a local and private nature. Provinces, therefore, have authority to legislate in areas of domestic and industrial water supply, pollution control, non-nuclear thermal and hydroelectric power development, irrigation and recreation. In fact, most provinces have delegated some of these responsibilities to municipal government bodies. In New Brunswick, for instance, municipalities have the authority to legislate regulations regarding water supply and pollution control as well as land use. Control over land use along rivers is within the zoning powers of municipalities as enabled under the Community Planning Act. The Act permits municipalities to develop land use plans and policies as well as zoning by-laws to control uses along rivers. Outside municipal boundaries, the Province has the responsibility for developing similar plans, policies and zoning regulations for Local Service Districts or non-incorporated areas. This matter is discussed in more detail in Section 5.4 on management options.

The constitution provides for exclusive federal jurisdiction over some matters that have both direct and indirect bearing on water management. Among these are federal authority over fisheries (Fisheries Act), navigation (Navigable Waters Protection Act), relations with foreign governments, federal lands, Indians, works for "the general advantage of Canada" and "peace, order and good government". The federal authority to legislate on these matters clearly limits the province's authority to manage water totally.

Many of the general powers established through the BNA Act are reflected in other subsequent federal and provincial acts. The Jurisdictional Review for the St. Croix River carried out in 1986 identified several federal and provincial acts which were considered to be useful in managing heritage rivers. The study of New Brunswick wetlands also outlined federal and provincial acts pertaining to wetland management in New Brunswick, many of which could pertain to heritage rivers. These documents, as well as many federal and provincial acts themselves, were reviewed and the most relevant acts are presented in the following sections along with a brief description of their contents.

5.3.2 Federal Acts Which Could Pertain To Management of Heritage Rivers

5.3.2.1 Department Of Environment

a) Canadian Environmental Protection Act - This Act is administered by the Minister of the Environment and provides a framework for the protection of Canadians from all forms of pollution caused by toxic substances. The Act improves the federal government's ability to manage chemical substances and covers the development, manufacture, transport, distribution, use, storage and disposal of such substances.

b) Canada Water Act - This Act sets the stage for administrative cooperation between the federal government and the provinces on water resource and water quality management and provides a firm basis for federal initiative in the absence of such cooperation. The Governor-in-Council may prescribe substances as waste, prescribe procedures to be followed by agencies in determining their recommendations to treatment changes and water quality standards.

c) Canada Wildlife Act - Under this Act the Minister may: (a) undertake, promote or recommend measures for the encouragement of public cooperation in wildlife conservation and interpretation; (b) initiate conferences and meetings respecting wildlife research, conservation and interpretation; (c) undertake programs for wildlife research and maintain laboratories for that purpose; (d) establish advisory committees and appoint members; and (e) coordinate and implement wildlife policies and programs in cooperation with the government of the province concerned. Lands may be acquired for wildlife research, conservation or interpretation. Regulations outline general prohibitions (i.e., swimming, hunting, fishing, picnicking, camping, boating, littering, etc.) which prevent any disturbance of habitat in wildlife areas. Also this Act prevents persons from damaging or disturbing soil, vegetation or artifacts. The Minister may designate any area as a wildlife reserve. A schedule of wildlife areas can be found in the regulation.

d) Historic Sites and Monuments Act - The Minister may, be means of plaques or other signs, mark or commemorate historic places. The Minister may also provide for the administration, preservation and maintenance of any historic places acquired pursuant to this Act. The Act also establishes the Historic Sites and Monuments Board of Canada which considers, among other things, recommendations respecting marking, commemoration, adminstration, preservation and maintenance of historic places and historic museums.

e) National Parks Act - For the arrangement and control of National Parks. The Governor-in-Council may make regulations for the protection of fish and the prevention of the obstruction or pollution of waterways, for using and disposing of mineral waters for recreational and therapeutic purposes and for the establishment of domestic water supply and sewage services.

f) Migratory Birds Convention Act - This Act is administered by the Department of the Environment, Canadian Wildlife Service. Designed for the protection of migratory birds, the act provides for habitat acquisition and for establishment of wildlife areas. It also prohibits the deposit of any substance harmful to migratory birds in any waters or any area frequented by migratory birds.

5.3.2.2 Department Of Fisheries and Oceans

a) Fisheries Act - The Fisheries Act controls the fisheries of Canada. Section 33, administered by Environment Canada, restricts the release of "deleterious substances" to the waters of the river. As well, provisions for fishways (Section 20), and fish habitat (Section 31) would have application and are under the administration of Fisheries and Oceans Canada. The Act states that no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat. Fish habitat is defined as spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

5.3.2.3 Department Of Transport

a) Navigable Waters Protection Act - This act is administered by the Ministry of Transport and enables the Minister to control the construction of works in navigable waters including bridges, booms, dams, wharves, docks, piers, tunnels, pipes and the approaches or other works necessary or appurtenant to such works as well as fill or excavation of the bed of a navigable water or any structure or device which might interfere with navigation. The Act and its regulations are concerned with the flow and elevation of water for navigation purposes.

5.3.2.4 Department Of Public Works

a) Expropriation Act - Under this Act any interest in land that, in the opinion of the Minister of Public Works, is required by the Crown for a public work or other public purpose may be expropriated. The Act also makes provision for other Ministers to undertake limited compulsory interferences with private property. A Minister may, after giving seven days notice to the owner, enter lands to undertake surveys, take levels, make borings and sink trial pits for a purpose related to a public work, deposit material required for a public work, dig, quarry and remove material from private lands, make temporary roads and drains, divert temporarily or permanently the course of watercourses, railways and roads, and alter the position of utilities on private lands.

5.3.2.5 Department Of Indian Affairs and Northern Development

a) Indian Act - This Act is administered by the Minister of Indian Affairs and Northern Development and empowers the Minister to authorize the use of lands on a reserve for specific uses or any other purposes for the general welfare of the band. The Governor-in-Council may also make regulations pertaining to licenses to cut timber or for the disposition of minerals.

5.3.3 Provincial Acts Which Could Pertain To Management Of Heritage Rivers

5.3.3.1 Department of Natural Resources and Energy

a) Crown Lands and Forests Act - An Act and Regulations enacted for the development, utilization, protection and integrated management of the resources of crown lands, including: (a) access to and travel on Crown Lands; (b) harvesting and renewal of timber resources on Crown Lands; (c) habitat for the maintenance of fish and wildlife populations; (d) forest recreation on

Crown Lands; (e) rehabilitation of Crown Lands; (f) watershed protection; and (g) general land management. The Minister may, with approval of the Lieutenant Governor-in-Council, authorize the use of Crown Land for purposes other than growing and harvesting timber such as parks, ecological reserves and areas of unique wildlife habitat. Violations such as damaging Crown Lands timber, removing of Crown Lands timber or any other property belonging to the Crown, trespassing on Crown Lands and littering on Crown Lands are punishable by fines and imprisonment.

b) Ecological Reserves Act - The objective of this Act is to reserve areas for ecological purposes: (a) that are suitable for scientific research and educational purposes and other aspects of the natural environment; (b) that are representative examples of ecosystems within the Province; (c) that serve as examples of ecosystems that have been modified by man and that offer an opportunity to study the recovery of the natural ecosystem from such modification; (d) in which rare or endangered native plants and animals in their natural habitat may be preserved; and (e) that contain unique and rare examples of botanical, zoological, pedological or geological phenomena. The Lieutenant Governor-in-Council and the Minister may, on Crown Land or on acquired private land, establish an ecological reserve, abolish an ecological reserve or change the boundary line of an ecological reserve. No person shall hunt, fish, trap, conduct explorations or boring, prospecting, levelling or construction; and in general, works of a nature that may alter any part of the terrain or of the vegetation and any acts of a nature that may disturb the fauna or the flora are forbidden. Also regulations prohibit the disposal of all waste materials within boundaries of a reserve. Regulations require, after the establishment of an ecological reserve, the formulation of a management plan.

c) Endangered Species Act - In this Act endangered species means any species or subspecies of fauna or flora threatened with extinction by reason of: (a) the destruction of habitat or a drastic modification or severe curtailment thereof; (b) disease; (c) over-exploitation; (d) predation; (e) the use of chemicals; or (f) any combination of the foregoing factors. The Lieutenant Governor-in-Council may declare any species or subspecies of fauna or flora to be endangered. No person shall destroy or interfere with any member of an endangered species of flora or fauna or the habitat of an endangered species of flora or fauna. Regulations declare the following species of fauna to be endangered: (a) eastern panther; (b) Canada Lynx; (c) Bald Eagle; (d) Osprey; (e) Peregrine Falcon; and the following species of flora to be endangered: (a) the Furbish Lousewort.

d) Fish and Wildlife Act - This Act and its regulations apply to all hunting and angling and rights of hunting and angling, and all matters relating thereto, except that this Act, and any lease, license, permit or regulation issued or made hereunder, shall not authorize or be deemed to authorize any interference with the navigation of any navigable water. Sections of the Act deal with matters such as non-residents, damage to private property, captivity of wildlife, disturbance of nest or eggs, export of wildlife and public use of the waters. Regulations under this Act pertain to: (a) angling (including Atlantic salmon); (b) fish ponds; (c) pheasant preserves; (d) wildlife refuges and wildlife management areas; (e) hunter orange; (f) moose hunting; (g) fur harvesting; and (h) hunting.

e) Forest Fires Act - This Act applies to all land within the jurisdiction of the Legislature and to all fires that are threatening or burning forest land. An area of forest land, together with all lakes and rivers situated within the forest land may be designated as a restricted travel area. In the forests, persons are prohibited from smoking while moving from one place to another, and from throwing away a burning match, ashes from a pipe, cigar or cigarette or any burning substance. Fire prevention respecting tents, recreational camps, industrial camps and mobile campers in or within 30 metres or forest land, and forest travel permits are regulated under this Act.

f) Mining Act - This Act requires that all persons who prospect for minerals, or work or operate a mine, obtain a license or lease for such purpose. Aliens, as well as Canadian Citizens, may enjoy the benefits of this Act by complying with its provisions. A license does not authorize the holder to cause damage to the soil or crops or interfere with the actual enjoyment of land. The Minister, whenever he deems it necessary for the protection of timber, may prohibit prospecting or mining. The Lieutenant Governor-in-Council may withdraw any lands in the Province from prospecting and staking out for all or certain minerals.

5.3.3.2 Department of Tourism, Recreation and Heritage

a) Parks Act - This Act authorizes the Minister, or any person designated by him to act on his behalf, in respect of a provincial park, to construct and operate camping, dressing room, picnic, toilet, cooking, bathing, parking, restaurants, refreshment booths, recreation facilities and other facilities for the convenience of the public. Facilities may be constructed for the public display of fish and wildlife. Any building, structure or site of historical significance may be preserved. Regulations prohibit persons to: (a) cut, damage or remove any plant, shrub, flower or tree; (b) remove any artifact or natural object; (c) make an excavation; (d) alter, damage or destroy any lake, watercourse or water spring; (e) remove, damage or deface any real or personal property of the Crown; (f) dispose of litter or waste material in areas other than those designated for that purpose; (g) hunt, trap, take, snare, injure or destroy any game animal, fur-bearing animal or other wild animal or any game bird or other wild bird; (h) fish; (i) operate a motorized snow vehicle, off-road vehicle, all terrain vehicle; (j) operate a motorboat in excess of seven kilometres; (k) camp without permit and other activities so listed.

(b) Tourism Development Act - This law was enacted to promote the development of the tourist industry, public parks, and handicraft industry in the Province. It is also designed to organize and maintain tourist information centres; to encourage and promote improvement in standards of accommodation, facilities, attractions and services offered to the public; and to promote, regulate and control tourist establishments offering services to the public. As well, picnic, camping, cooking, bathing, parking, refreshment booths, restaurants, shops and other facilities for the convenience of the public may be constructed. This Act governs the content and publication or display of advertising matter. Regulation provides for licensing of campgrounds, outfitters' camps and other tourist establishments.

c) Historic Sites Protection Act - The Minister may designate any site, parcel of land, building or structure of any kind to be a historic or anthropological site within the meaning of this Act. Also, any historic or anthropological site may be designated as a protected site. No person shall excavate or alter in any way a protected site or remove from it any historical or anthropological object unless he is the holder of a permit and has consent of the owner. Archaeological field research may be conducted only by those who possess a valid license. A suitable marker may be erected at any historic, anthropological or protected site.

5.3.3.3 Department of the Environment

a) Clean Environment Act - Under this Act, the Minister may issue a control order requiring a person: (a) to control the release of waste into the environment; (b) to alter the manner of discharging waste into the environment; (c) to stop releasing any waste into the environment; (d) to alter the procedures to be followed in the control or elimination of waste; (e) to install, replace or alter any equipment designed to control or eliminate waste; and (f) to clean up (site rehabilitation) where contaminant or waste has been discharged. The Minister may issue a stop order if he is of the opinion that a contaminant discharging, depositing, leaving or emitting any waste poses an immediate danger to human life, the health of any person, fish, animal or plant life, or property. Additionally, any person who contemplates a hydroelectric power project, a control dam, a river diversion, a drainage diversion or any watercourse alteration must submit plans or other information as the Minister requires, and will proceed with the project only with a valid and subsisting permit issued by the Minister. In addition to permitting requirements under this regulation, there is also a watercourse protection mandate through the requirements for forest buffer zones during operations. Regulations, under this Act, focus on: (a) water quality; (b) pulp and paper industry emission; (c) air quality; and (d) watercourse alterations.

b) Pesticides Control Act - This Act and Regulations prohibit persons from washing or submerging any equipment used to perform a pesticide application in any body of water in such a manner than any pesticide may be directly or indirectly discharged or deposited in that body of water unless he is the holder of a permit authorizing him to do so. The Act also designates the licensing and permitting requirements for the sale, storage and application of pesticides. The Act is applicable to all aerial pesticide applications, and all ground applications. The Minister (and the Department) are given wide powers in administering this Act.

5.3.3.4 Department of Health

a) Health Act - This Act and Regulations contain provisions for the construction of food and restaurant service, vending and mobile canteen service as well as potable water supplies, sanitary facilities and waste disposal.

5.3.3.5 Department of Municipal Affairs

a) Community Planning Act - This Act represents the enabling legislation which permits the municipalities in the Province to plan land use within their confines

(Municipal Development Plans) and enables the Province to plan for land use in the unincorporated areas (Area Plans and Basic Planning Statements). It also permits the Province to plan at the regional level (Regional Plans). The Act also sets out the by-laws that can be adopted to implement land use plans and policies. These include zoning by-laws, subdivision by-laws, building by-laws and other more minor by-laws related to street widening and controlled access.

b) Municipalities Act - Under the Act municipalities may provide services such as drainage, sewage, water, community services and recreational facilities. The municipality may further use the right of expropriation for its purposes whether the land expropriated lies within or without the boundaries of the municipality as long as it does not lie within another municipality.

5.3.3.6 Regional Development Corporation

a) Regional Development Corporation Act - The Regional Development Corporation Act (formerly Community Improvement Corporation) may make and administer regulations, to be approved by the Lieutenant Governor-in-Council respecting the more efficient use and economic development of land in the Province and has power in any area of the Province designated by the Lieutenant Governor-in-Council to prepare plans for regional development, and to coordinate and guide orderly economic development.

5.3.3.7 Department of Justice

a) Trespass Act - This Act prohibits unauthorized persons from trespassing on forest land, agricultural land or premises owned, occupied or controlled by another. No person shall trespass by means of a motor vehicle or a motorized snow vehicle on lands which he has had notice not to trespass (campers, hikers, snowmobilers, hunters, boaters and sports fishermen). The Act also prohibits vehicular trespass in wildlife refuges or management areas, ecological reserves, watercourses, lake or ocean shore areas, and saltwater or freshwater marshes, for any class of land (i.e., public or private).

5.3.3.8 Department of Transportation

a) Highway Act - Sections of this Act may pertain to development and could apply to hunters, campers, hikers and anglers. For instance, the Minister may restrict the use of a resource access road with respect to: (a) fire prevention; (b) public safety; (c) road conditions; (d) industrial and commercial operations; and (e) sport fishing and hunting. Pursuant to this Act no person shall place any refuse on his own land or the land of any other person without the consent of that other person, in such manner as to (a) be unsightly; (b) create a fire hazard; (c) be detrimental to the health, safety and welfare of the public; or (d) being in a watershed area, be apt to pollute any water of that watershed.

b) Expropriation Act - Empowers the Lieutenant Governor-in-Council to purchase or expropriate any land that may be deemed necessary or desirable for the carrying out of any public work or enterprise, or other public purpose, or for the carrying out of any work or enterprise deemed to be in the public interest. "Public work" is defined as including dams, harbours, piers, works for improving the navigation of any water, slides, dams, piers, booms, and other works for facilitating the transmission of timber, and all other property belonging to the Province, and also works, properties and undertakings acquired at the expense of the Province, or for the acquisition or construction of which public monies are visited and appropriated by the legislature otherwise than by way of subsidy.

5.4 Management Options in New Brunswick

As described in Parks Canada (1984), before formal designation to the CHRS, the agency which has nominated the river must lodge a management plan with the Canadian Heritage Rivers Board.

It is not the purpose of this document to develop or suggest management plans for heritage rivers in New Brunswick. However, it is appropriate in examining management feasibility and its implications to consider the general management options that might be available within the current legislative structure of the Province.

5.4.1 Application of Acts By The Various Government Departments

At the present time there is no overall act or department in New Brunswick responsible for comprehensive management of water resources. There are several acts, as outlined in Section 5.3, which deal with water, land and resource management issues which could be used as management tools supportive of the CHRS objectives. Up to this point, all of the rivers in Canada designated as heritage rivers have been within national or provincial parks, which is ideal from a management point of view. In New Brunswick, as in the other Atlantic Provinces, most of the potential heritage rivers flow through freehold land. Recent statistics obtained from the Crown Lands Branch of the Department of Natural Resources and Energy indicate that Crown Land represents approximately 44 per cent (3,151,300 ha.) of the total Provincial land area (7,123,775 ha.). Federal Crown Lands comprise approximately 208,811 ha. If the designated sections of a heritage river were on Crown Land, the general consensus is that management would be relatively easy. All Crown Land falls under the control on one agency, the Department of Natural Resources and Energy, and through the Crown Lands and Forest Act, the Minister can exercise extensive management and control in keeping with the CHRS objectives.

This does not mean that management on Crown Lands would be without its problems. Even at the present time the Department of Natural Resources and Energy has senior staff trying to address the problems associated with the increasing conflicts between users on Crown Land waters. The problems on the Restigouche and other major fishing rivers, for instance, involve conflicts between fishermen and canoeists and relate to the increasing demand on the river system from both activities. Indiscriminate garbage dumping, fires, vandalism and lack of etiquette on the part of the increasing number of canoeists and campers are creating problems with the use and enjoyment of the rivers by recreational fishermen as well as outfitters. Further research is needed on the technical side to address the problems such as carrying capacity of such rivers in order to accommodate demands from all users. More funding is also required to provide landing areas, campsites, garbage handling and toilet facilities resulting from increased demand from recreational users. In some cases these rivers and associated activities are being promoted for tourism, before factors such as carrying capacity have been determined or the required infrastructure to preserve and protect the resource has been provided. Although these problems are real and current they can be resolved through research and funding support and would involve very few government departments (mainly Department of Natural Resources and Energy and Department of Tourism, Recreation and Heritage).

Management of heritage rivers outside Crown Lands would be much more complex. Management is compounded by the many political or administrative jurisdictions (federal, provincial, municipal, regional and private) that exist as well as the multitude of demands that are placed on the river system for water supply, hydroelectric power, sewage disposal, commercial use, fisheries and recreation. At the present time, with no overall act, agency or coordinating structure for heritage rivers or water resource management, management for protection and conservation of heritage rivers would depend on the enforcement of the various acts listed in Section 5.3 by the separate government departments charged with responsibility for implementation and enforcement of those acts.

Not all of the Provincial acts listed previously would apply to all rivers and some acts are more critical than others. In terms of land use control along rivers, the most significant act would be the Community Planning Act and the Clean Environment Act (or the Clean Water Act) would be the most important with respect to the water resource itself.

The Community Planning Act currently is the most comprehensive legislation which could be used to manage heritage rivers. Under the Community Planning Act, most municipalities in the Province have prepared and adopted land use plans and accompanying zoning and subdivision by-laws. These can, and many do, include designation of corridors along rivers as open space, recreational or conservation zones in which uses are limited to non-intensive uses in order to protect and enhance the river resource.

In New Brunswick all areas lying outside of municipalities (cities, towns, or villages) are unincorporated and are without local government. Most are without any kind of community or rural development plans and there is an absence of resource development plans.

The Community Planning Act empowers the Province to prepare basic planning statements, area plans and regional plans for the unincorporated areas. To date, the Province has adopted no regional or area plans, but has adopted some basic planning statements, mostly for local service districts trying to protect themselves from unwanted development.

There is some potential for assistance in unincorporated areas through the Regional Development Corporation Act. Under this Act, formerly the Community Improvement Corporation Act, a coordinating committee, for instance, was set up during the process to nominate the St. Croix River to the CHRS. Under the Act, assistance may be provided in the form of grants, contributions or loans in connection with a project assigned by the Lieutenant-Governor in Council or any department, corporation or agency of the Province. There is no specific program for such assistance and a specific request would have to be made to the Corporation.

The major problem with the use of the Community Planning Act as a tool for the management of heritage rivers, therefore, is its weakness to address land use management in unincorporated areas which are much more affected by heritage rivers than the municipalities. The weakness lies, not in the Act itself but, in the lack of responsible elected representation and the lack of a bureaucratic structure for implementation of land use policy or control.

This situation is further complicated by a lack of appreciation for, or acceptance of, the need for planning controls on the part of rural area residents. It is highly critical, therefore, that any attempt at land use management be accompanied by a public participation program. This aspect is discussed further in Section 5.4.5.

As pointed out in the Working Paper on Land Use and Water Use Policy by the Office of Government Reform in 1985, the rural areas are managed by many different government agencies, each with a particular responsibility to protect or preserve land, to provide services, administer grants or assistance, or to collect taxes, royalties or other revenue. There is no comprehensive view or strategy of what is being done collectively, for what overall purpose, or at what cost and for what benefit.

So while government currently has a series of policies that influence land use, and while it also administers a number of programs that influence or directly control land use, both its policies and programs have evolved on an ad hoc basis to the point where they may have contradictory objectives that invite, rather than resolve, land use conflicts (Office of Government Reform, 1985).

The 1985 Working Paper also pointed out that it was the 14th report to government in ten years describing the random and uncoordinated efforts of government departments and agencies, acting independently, to influence land use in the Province of New Brunswick, and citing the need and real potential of improving overall effectiveness of programs and services through a coordinated approach.

The 1985 Working Paper also described the Provincial situation with respect to water use. It stated that water use in the Province of New Brunswick is directly controlled, managed or influenced by a variety of departments and agencies which undertake activities of their own, or offer programs and services to the municipal level of government or to industry, to protect, control, alter, use and/or dispose of water.

The following provincial departments and agencies were identified as having interests in water, and play roles, varying from active to passive, in influencing its use:

Natural Resources and Energy

- Fish habitat management and management of the Musquash Watershed.
- Recreation use.
- "Bed of the Sea" management.
- Access to the watercourse.

Environment

- Protection of water from pollution and stimulation grants to municipalities for sewage system development.
- Flood forecasting and flood damage reduction.
- Water resource assessment.
- Water resource development.
- Field surveys.

Municipal Affairs

- Water system ownership, management and stimulation grants to municipalities for water system development.
- Emergency Measures Organization.

Commerce and Development

- Operation of water systems in some industrial parks and funding of some industrial systems.

Regional Development Corporation

- Allocating and distributing federal-provincial funds for water and sewage infrastructure projects as well as certain watercourse-related "special initiatives" in the McAdam area.

Health and Community Services

- Public health and potable water.
- Well drilling for welfare recipients.

Fisheries

- Offshore waters as fish habitat.

Tourism, Recreation and Heritage

- The recreational potential of watercourses and ocean frontages.

Agriculture

- Farm land irrigation and drainage.

New Brunswick Electric Power Commission

- Hydroelectric power generation.

The 1985 Working Paper recognized that all of these, in addition to the two other levels of government and the private sector, have roles to play, and all operate without the benefits of even a framework policy to guide their activities. Neither is there any identifiable single point of contact for the public on water-related issues.

In such circumstances, there are many areas of conflict between water users, and corresponding conflicts between managers who each view their particular responsibilities as the prime determinant for water usage.

There are also 18 federal departments and agencies which administer programs that impact directly on the water resources of New Brunswick in addition to the provincial departments and agencies listed.

Although the Federal and Provincial Departments of Environment are recognized as the "lead agencies" on water issues, neither is in a position to influence the operating decisions of other departments at their respective levels.

5.4.2 Inter-Departmental Management Structure

Given the conclusions of the 1985 Working Paper on Land Use and Water Use Policy, it appears that the option of having the various government departments independently responsible for management of heritage rivers would only add to what is already a complex management situation. It would seem that a better option would be to set up some kind of inter-agency management structure involving all government departments with acts or regulations affecting the designated river.

This is consistent with conclusions reached by L.A.Rutherford and Associates (1987) which point out the need for an inter-departmental management committee. That study suggested that the success of such a structure was dependent upon a number of factors including:

- the government will to pass a policy to ensure the conservation of a heritage river and its resources;
- the effectiveness of the policy in clearly defining the goals and objectives of heritage river conservation and each participating department's roles in the management process;
- the cooperation and commitment of all government departments involved in heritage river management to achieve the goals and objectives of heritage river conservation;

- the effectiveness of existing legislative tools in meeting the requirements of heritage river management; and

- the coordinating ability of the heritage river management committee in the formulation and implementation of a management plan.

New Brunswick already has a good example of how this inter-departmental structure might be achieved. Subsequent to the Working Paper on Land Use and Water Use Policy, the Department of Municipal Affairs and the Department of Environment were combined in October, 1985 into the Department of Municipal Affairs and Environment. Although the departments have been split again (1989), their short union did result in some positive measures being taken in the area of combined land use and water use planning. This refers specifically to the formation of a Land and Water Advisory Committee under the Clean Water Act and the introduction of the Watershed Designation Program.

The new Clean Water Act is a major positive step in dealing with water management issues. All water aspects formerly under the Clean Environment Act have been transferred to the Clean Water Act. The Act is designed primarily to address the issue of water quality, particularly with reference to public water supply systems. Although the Act cannot be used directly to reserve or manage rivers for heritage purposes, there are certainly benefits that would accrue to the natural heritage, human heritage and recreational value of rivers through the application of the Act to water quality matters.

In addition to the Clean Water Act itself, committees set up under the Act (such as the Land and Water Advisory Committee) and programs under the Act (Watershed Designation Program) illustrate that the Province of New Brunswick has the capabilities to set up structures and programs to manage the water resource. Some features of these Committees and programs will be described in the following section in order to better appreciate how a similar structure or program could possibly be set up to deal with heritage rivers.

The Land and Water Advisory Committee as described under Section 31 of the Clean Water Act is comprised of members who are employed by the Province and who represent departments, commissions, offices or other bodies that have direct interest in land and water use. At the present time, the Committee has representatives from the Departments of Tourism, Recreation and Heritage; Natural Resources and Energy; Municipal Affairs; Environment; Transportation; Commerce and Technology; NB Power; Health and Community Services; Agriculture; Supply and Services; Policy Secretariat and the Economic Development Commissioners office.

The duties of the Committee as described under the Act include:

a) to share among its members information respecting the activities of the departments that relate to land and water use;

b) to make recommendations to the Minister concerning land and water use policies;

c) to develop methods to avoid and resolve conflicts and problems concerning land and water use;

d) to review the content and operation of this Act and the regulations and recommend to the Minister any amendments that, in the opinion of the Committee, would increase its effectiveness;

e) at the request of the Minister, to investigate, report on to the Minister and advise the Minister concerning any matter coming within this Act; and

f) to perform such other duties as are established by regulation.

Although this committee, as defined under the Act, would not serve as a management agency it could be an initial review agency. With so many key departments represented, it could provide a comprehensive overview to ensure government activities which affect the management of heritage rivers are coordinated with the various acts and regulations. The members not only appreciate the need to enforce the acts but they could also provide technical advice from their various areas of expertise. Review by this committee would also go a long way to establishing credibility for the heritage river program.

At the present time the Terms of Reference are being finalized for a sub-committee of the Advisory Committee called the Interdepartmental Land and Water Use Committee. This committee, with a six-month mandate, will be composed of senior policy people who will be charged with the preparation of a working paper on land and water use policy. The focus of the committee will be on practical and implementable policies. It is possible that the heritage river program could merit consideration by that group if its mandate were to be extended beyond the six-month period currently envisaged.

It is not inconceivable that one of these committees, as described above, could be a forerunner leading to the establishment of a similar committee that might deal strictly with heritage rivers.

5.4.3 River Classification and Performance Standards

Under the Clean Water Act there may be other regulations that will be introduced that could assist in the management of heritage rivers. For instance, consideration is being given to the development of a classification system for rivers based upon the need to protect its water quality. Rivers for which high water quality standards were critical would have more stringent limitations on development and use than those that were not as critical. Again heritage rivers might be considered in developing such a classification system. One of the problems at present (for heritage river considerations) is that water quality guidelines and monitoring are based on drinking water standards. Other than some general guidelines mentioned by Health and Welfare Canada in the Canadian

Drinking Water Standards, there are few standards related to water quality for recreational use (swimming, boating, fishing). This may not be a major obstacle since water quality requirements for Canadian Heritage Rivers are not as stringent and may be interpreted quite liberally.

Another approach that might be worth considering is to base management of heritage rivers on performance criteria standards as opposed to straight land use controls, i.e., the acceptability of various land uses or activities would be based on acceptable water quality guidelines for recreational use. This approach would require ongoing monitoring of water quality. Such an approach would fit in well with a classification system such as that mentioned above.

5.4.4 Heritage River Designation

Another possible management option which could be considered would be to set up a Heritage River Designation Program similar to that presently used for watershed designation in New Brunswick.

Another positive feature of the new Clean Water Act is the aspect dealing with the whole watershed designation process. Under the watershed designation program the act empowers the Minister of the Environment to designate the source of public water supply as a protected area. Within such a protected watershed area the Minister may:

a) allocate the use of water;

b) control, prohibit, restrict or limit any activity or thing which might impair the quality of the water;

c) restrict or prohibit unsuitable land uses; and

d) establish and enforce guidelines and standards for the purpose of protecting the quality of the public water supply.

Watershed designation is based on a policy of water quality maintenance through land use and development controls in municipal water supply watersheds. This technique is one form of watershed management which is thought to be beneficial over the long term in protecting water quality and preventing the need for more complex and subsequently more expensive water treatment. The protection of these watersheds will ensure a clean potable water supply for all of the people using these municipal sources.

Watershed designation is an improvement over land use controls through zoning with respect to protection of watersheds. Land use control through zoning is limited in that only land uses which can be controlled when the site is being selected for a particular type of development (developing a camping or picnicking site, buildings, farm operations, residential development, powerlines, hiking or nature trails, etc.) can be effectively controlled. Regulations and by-laws under the Community Planning Act enable the control of these types of uses through a zoning by-law. The authority of zoning, as enabled through the Community Planning Act, does not address the control of potential activities which occur after the site has been developed (fishing, burning, swimming, mineral extraction, spraying of pesticides, etc.). The authority given to the Minister of the Environment through the Water Quality Regulation, (N.B. Regulation 82-126), includes the control of these activities. This makes watershed designation a much more powerful tool than zoning with which to control activities within the watershed.

As another option it may be worth considering the adoption of a similar program for the management of heritage rivers. This would require consideration of separate legislation that would provide a designated heritage river with protection that would ensure development would be in keeping with the objectives and guidelines as established for the CHRS program.

As pointed out in Section 5.4.2, the recent experience with the interdepartmental committees and the watershed designation program illustrates that the Province has the capability to manage the water resource. The watershed designation program will be applicable to over 30 watersheds in the province. A question likely to arise is whether a similar designation program for heritage rivers is required or justified in order to result in the management of only a few rivers that might eventually be designated in New Brunswick.

5.4.5 Public Consultation

Regardless of the approach taken, the options presented above for consideration - management through enforcement of existing legislation by the various departments concerned, management through some form of inter-departmental agency or committee or separate legislation such as the watershed designation program - would all involve control over land uses and activities on private property. Historically land use controls proposed in relation to government programs have not been popular with private landowners. To ensure public support for the designation and management of heritage rivers, L.A.Rutherford and Associates (1987) suggested a public consultation process is essential to reach an agreement on heritage river management requirements and private landowners interests. This need was also recognized in New Brunswick and was utilized as part of the watershed designation program. There is no doubt that such a public participation program would be necessary as part of a heritage river program in New Brunswick. It not only serves to inform the public, but it also helps to establish credibility for the program and is useful as a vehicle to obtain feedback that is necessary in order to arrive at acceptable policy and regulations.

It is recognized that before any of the rivers under consideration are designated under the CHRS program, a full management plan would have to be prepared. By the time that is likely to be required many of the programs and committees described in the above options will have had time to operate and be evaluated in terms of their applicability or appropriateness as options to be considered for management of heritage rivers.

6.0 RIVER MANAGEMENT FEASIBILITY ASSESSMENT

6.1 Introduction

Rivers are complicated entities to manage since there are so many potential ownership and jurisdictional patterns along with a multitude of demands on the resource for urban and rural uses, active and passive recreation, infrastructural requirements as well as conservation and protection. It is not surprising, then, that resource conflicts arise between the various users, each viewing the resource from their particular perspectives and value systems.

This section briefly describes issues and concerns that affect the management of heritage rivers in New Brunswick. The issues are similar to those identified by L.A.Rutherford and Associates (1987), but are modified or adapted to the particular situation that exists in the New Brunswick context. These considerations form the basis from which criteria were developed and applied to assess the management feasibility of the various rivers under consideration.

6.2 Management Considerations

6.2.1 Land and Resource Ownership Patterns

Land and resource ownership patterns would have a significant impact on the ease of heritage management in New Brunswick. Land under federal or provincial government control presents fewer constraints for management than land under private ownership. This issue was discussed in some detail in Chapter 5.0.

In New Brunswick 44 percent (3,151,300 ha) of its 7,123,775 ha is Crown owned. Along the rivers under consideration approximately 60 percent of their total length is under private ownership.

For rating land ownership, a score of 1 to 10 was assigned based on the percentage of the length of the river environment in Crown ownership (i.e., a score of 1 if 10 percent up to a score of 10 if 100 percent in Crown ownership).

6.2.2 Jurisdictional Patterns

The number and type of government jurisdictions along a heritage river would affect the ease of management of the resources. Generally, the greater the number of governments involved in river management, the more complicated the management process. A large number of governments involved in heritage river management would likely result in more complex coordination, implementation and monitoring tasks.

Federal and provincial governments would exhibit the highest level of management and control of heritage river resources as they have greater legislative abilities to deal with the wide range of heritage river values and management concerns.

The federal land identified along study rivers, included national parks, federal reserves, military reserves and Indian reserves while Provincial lands included similar categories of provincial parks, ecological reserves, etc. In New Brunswick, the Province also has jurisdiction over the whole unincorporated portion of the province, (i.e., all land lying outside an incorporated city, town or village).

For rating jurisdictional patterns, a score from 1 to 10 was determined by subtracting from 10 the number of jurisdictions within the river environment (i.e., a river flowing through Crown Land and 3 municipalities was assigned a score of 10-4 or 6). However, where Provincial Crown Land comprised the river environment, the river scored 10.

6.2.3 Urbanization

Areas that have been intensely developed present greater management problems. Areas that have been developed as communities, rural housing settlements, commercial or industrial developments and farms all tend to complicate the management of land within the river environment. In addition to land consumption and control, these activities often require use of river water and/or discharge back to the river creating potential for pollution or contamination of water as well as disturbance of the banks and river environment.

For rating urbanization, a score from 1 to 10 was assigned based on the percentage of the length of the river environment that was developed for urban type uses (i.e., a score of 1 if 90 percent were developed, up to 10 if no land was developed for urban uses).

6.2.4 Linear Development

Potential problems associated with highways, railways, and transmission lines in the river environment include scenic impacts on landscape quality, impacts on wildlife and vegetation (i.e., road kills, pesticide use for vegetation control) and erosion problems during construction of new linear developments. The greater the number of linear developments the greater also is the potential for access for land uses and activities that could also result in more difficult management.

For rating linear development, a score from 1 to 10 was assigned based on the percentage of the length of the river environment affected by linear development (i.e., a score of 1 if 90 percent is affected, up to 10 if there is no linear development).

6.2.5 Recreation and Conservation Use

National and provincial parks, historic sites, wildlife and bird sanctuaries, preserves and management areas along a watercourse provide a beneficial impact on management because these forms of land use are supportive of the conservation of heritage values.

Existing recreational use of a river corridor (i.e., river travel, angling, etc.) is also beneficial for management as existing use often means that a certain level of management or recreational infrastructure (i.e., access points) is already in place. In addition, certain recreational uses are indicators of a river environment with quality resources.

Because of the importance attached to recreation and conservation use, this component was given double the weight in the scoring system as was given to the other issues.

For rating recreation/conservation use, a score from 1 to 20 was assigned based on the percentage of the length of the river environment falling within the boundaries of designated parks, ecological reserves, historic sites, refuges, protected sites, etc. Historic sites have been arbitrarily assigned a value of 1/10 of 1 percent of the length. If 10 percent of the length of the river environment is in a Provincial Park, the river would score (0 + 1) x 2 = 2.

6.2.6 Agricultural Activities

Generally, rivers in intensively used agricultural areas have a low heritage river management rating as a result of the potential for poor water quality conditions and limited tools or resources to regulate agricultural activities. Intensive agricultural activities are a concern for health and water quality, not only from a waste disposal point of view but also with respect to the products used in the processes (i.e., pesticides, drugs, processing chemicals). Intensive agriculture is not well defined in New Brunswick and although there are guidelines for proper manure handling, storage and spreading, they are not uniformly implemented or enforced.

It was not possible to determine an accurate figure for the amount of land under active cultivation within river environments. Therefore, for rating agriculture, a score from 1 to 5 was assigned based on the number of areas within the river environment with a concentration of agricultural activities. Because of the relatively minor concern with this component, it was assigned a weight of half that of other components. For example, if a river environment had 3 areas with concentrated agricultural activity, it scored (10-3) x .5 = 3.5.

6.2.7 Forestry Operations

Forestry operations occurring on both freehold land and Crown Land affect a large area in New Brunswick. Some forestry practices such as clear cutting and access road construction can have detrimental effects on water quality as well as on scenic and wilderness qualities. Although buffer zones or setback areas along watercourses are required on Crown Land, these are not always respected. The Province licenses Crown Land to several large forestry companies and adherence to the standards established are not uniform. Management of heritage rivers could be complicated by existing licence agreements and private operations. For assessing forestry operations, information was acquired from the Timber Management Branch and unpublished documents (proposed GIS map book).

For rating forestry operations, a score from 1 to 10 was assigned based on the percentage of the length of the river environment affected by recent forestry operations (i.e., a score of 1 where 90 percent of the length of river environment was affected, up to 10 where none was affected by forestry operations).

6.2.8 Fisheries

This management consideration includes commercial fisheries, Native food fisheries, and aquaculture developments. Many rivers in New Brunswick have important gaspereau, shad, smelt, eel, salmon, and sturgeon fisheries. In addition, rivers are often used as a source of water for fish hatcheries. These uses of rivers create a number of potential conflicts with heritage river management.

Commercial and Native food fisheries which utilize nets can interfere with recreational uses of a river, most notably river travel and vice versa. Salmon and trout hatcheries use large quantities of water from rivers. Water that is discharged back into the river often contains more nutrients, which may lead to eutrophication problems. Potential vectors for disease may also be introduced to rivers from fish hatcheries, deleteriously affecting native stocks of salmonids. Commercial fisheries may also affect the angling quality of a river by intercepting anadromous species returning to spawn and salmon smolt migrating to the sea.

For rating fisheries, a score from 1 to 10 was assigned by deducting from 10 the number of commercial or Native fisheries, hatcheries and aquaculture operations on the river.

6.2.9 Hydroelectric Power Development and Dams

Hydroelectric power development alters the hydrological regime of a river system with negative impacts on wildlife values (i.e., fish runs), some recreational opportunities and scenic qualities of the river environment. Extensive hydroelectric development can irreversibly damage the hydrological and ecological integrity of a river system.

For rating hydro and dams, rivers with impoundments were given a negative weight equal to double the weight assigned to other components. A score was thus assigned from 0 to minus 20 based on the percentage of the length of the river environment affected by impoundments. For example, a river with 60 percent of its length affected by impoundments would score 0 - 6 = -6 x 2 = -12.

6.2.10 Mineral and Aggregate Resources

Metallic and industrial minerals are distributed widely in New Brunswick, increasing the possibility of mining - heritage river conflicts. Potential impacts of mining operations on rivers include: excessive water demands for mining processes; discharge of polluted water used in mining processes or dewatered from mine shafts, quarries, etc.; runoff and erosion problems from mine sites and access roads; scenic impacts.

Some of these operations occur on Crown Lands, under lease agreement while others occur on private lands with varying degrees of approval, monitoring or enforcement of regulations.

For rating mining, a score was assigned from 1 to 10 by deducting from 10 the number of mines, tailings and quarries within the river environment.

6.3 Determination of Management Feasibility Score

The assessment of management feasibility for the study rivers is contained in this section. The assessment was based on an evaluation of the selected management issues and concerns, as described in Section 6.2, over the length of river within the study boundaries. This included existing land and water use and, where possible, potential or expected future uses (i.e., highway and transmission line corridors and river crossings, dams, etc.).

Each of the management considerations were rated according to the scoring criteria described in Section 6.2. Following this, the individual ratings were summed to get the management feasibility score. This score has a maximum possible value of 95.

Table 6-1 contains a summary of the management feasibility scores. The detailed results of the management feasibility assessment are presented in Tables 6-2 through 6-25 (scores are rounded off to the first decimal place).

TABLE 6-1

Summary of River Management Feasibility Scores

RANK	RIVER	SCORE
1	Patapedia	84.2
2	Kedgwick	80.6
3	Cains	68.4
4	Dungarvon	64.1
5	Upsalquitch	63.3
6	Portobello	63.1
7	Kouchibouguac	59.2
8	Eel	57.5
9	Little Southwest Miramichi	56.3
9	Restigouche	56.3
10	Nepisiguit	54.7
11	Oromocto	52.1
12	Tetagouche	49.2
13	Northwest Miramichi	46.1
14	Richibucto	42.8
15	Nashwaak	41.5
16	Magaguadavic	39.9
17	Tobique	37.2
18	Southwest Miramichi	30.9
19	Lower Saint John	24.7
20	Petitcodiac	20.8
21	Kennebecasis	17.9
22	Upper Saint John	16.2
23	Middle Saint John	7.2

TABLE 6-2 - CAINS RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	8.7	Approximately 87 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	9.0	There is only 1 government jurisdiction, provincial.
Urbanization	9.7	Approximately 3 percent of the length of the river environment contains urban uses.
Linear Development	6.9	Approximately 31 percent of the length of the river environment is occupied by highways including 2 crossings, 2 transmission line crossings, and 1 railway crossing.
Recreation/Conservation Use	3.0	Approximately 15 percent of the length of the river environment is occupied by the Bantalor Game Management Area.
Agricultural Activities	5.0	There are no areas of concentrated agricultural use.
Forestry Operations	7.1	Approximately 29 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	10.0	There is no fishery.
Hydro and Dams	0.0	There are no existing or proposed hydroelectric developments.
Mineral and Aggregate Resources	9.0	There is 1 quarry operation within the river environment.

Management Feasibility Score 68.4

TABLE 6-3 - DUNGARVON RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	9.0	Approximately 90 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	9.0	There is 1 government jurisdiction along the river, provincial.
Urbanization	9.5	Approximately 5 percent of the length of the river environment contains urban uses.
Linear Development	4.9	Approximately 51 percent of the length of the river environment is occupied by highways including 4 crossings, 10 percent of the length of the river environment is occupied by transmission lines including 1 crossing.
Recreation/Conservation Use	2.2	Approximately 11 percent of the length of the river environment is occupied by the Plaster Rock/Renous Game Management Area.
Agricultural Activities	5.0	There are no areas of concentrated agricultural use.
Forestry Operations	8.5	Approximately 15 percent of the length of the environment has been disturbed by recent forestry operations.
Fisheries	10.0	There is no fishery.
Hydro and Dams	0.0	There are no existing or proposed hydroelectric developments on the river.
Mineral and Aggregate Resources	6.0	There are 4 quarry operations within the river environment.

Management Feasibility Score 64.1

TABLE 6-4 - EEL RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	2.9	Approximately 71 percent of the river environment is privately owned.
Jurisdictional Pattern	9.0	There is 1 government jurisdiction along the river, provincial.
Urbanization	9.6	Approximately 4 percent of the length of the river environment contains urban uses.
Linear Development	6.5	Approximately 35 percent of the length of the river environment is occupied by highways including 5 crossings, 1 percent by transmission lines including 3 river crossings and 18 percent by railways including 1 river crossing.
Recreation/Conservation Use	0.0	None.
Agricultural Activities	5.0	There are no areas when agricultural use is concentrated.
Forestry Operations	5.5	Approximately 45 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	10.0	There is no fishery.
Hydro and Dams	0.0	There is no hydroelectric development.
Mineral and Aggregate Resources	9.0	There is 1 quarry operation within the river environment.

Management Feasibility Score 57.5

TABLE 6-5 - KEDGWICK RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	10.0	The entire length of the river environment is Crown Land.
Jurisdictional Pattern	10.0	There is 1 government jurisdiction, provincial.
Urbanization	9.8	Approximately 2 percent of the length of the river environment contains urban uses.
Linear Development	7.0	Approximately 30 percent of the length of the river environment is occupied by highways including one crossing.
Recreation/Conservation Use	10.0	The Kedgwick River forms the boundary for the Kedgwick Game Management Area.
Agricultural Activities	5.0	There are no areas where agricultural use is concentrated.
Forestry Operations	8.8	Approximately 12 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	10.0	There is no fishery.
Hydro and Dams	0.0	There is no existing or proposed hydroelectric developments.
Mineral and Aggregate Resources	10.0	There are no quarry operations or mining operations.

Management Feasibility Score 80.6

TABLE 6-6 - KENNEBECASIS RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	0.6	Approximately 94 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	0	There are 11 government jurisdictions within the river environment - provincial, and the municipalities of Saint John, Rothesay, Fairvale, Renforth, East Riverside-Kinghurst, Hampton, Quispamsis, Gondola Point and Norton.
Urbanization	2.1	Approximately 79 percent of the length of the river environment is occupied by urban uses.
Linear Development	1.3	Approximately 87 percent of the length of the river environment is occupied by highways (with 23 crossings), 25 percent by transmission lines (2 crossings) and 26 percent by railway lines (1 crossing).
Recreation/Conservation Use	0.03	There are 3 historic sites (European/North America Railroad-Rothesay, Stony Craft - Quispamsis and Hampton Gaol) within the river environment.
Agricultural Activities	1.5	There are 7 areas of concentrated agricultural activity - Penobsquis, Sussex, Apohaqui, Hampton, Norton, Renforth, Bloomfield.
Forestry Operations	8.4	Approximately 16 percent of the length of the river environment has been disturbed by forestry operations.
Fisheries	4	Several commercial fisheries (eels, gaspereau, sturgeon, smelt, shad), and 1 aquaculture operation.

Hydro and Dams	0	There are no hydroelectric developments on the river.
Mineral and Aggregate Resources	0	There are 12 quarry operations and potash mining at Sussex.

Management Feasibility Score 17.9

TABLE 6-7 - KOUCHIBOUGUAC RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	7	Approximately 70 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	8	There are 2 government jurisdictions along the river - federal and provincial.
Urbanization	8.8	Approximately 12 percent of the length of the river environment contains urban uses.
Linear Development	4.4	Approximately 56 percent of the length of the river environment is occupied by highways including 9 highway crossings, 1 transmission line and 1 railway crossing.
Recreation/Conservation Use	4	Approximately 20 percent of the length of the river environment is occupied by Kouchibouguac National Park.
Agricultural Activities	4	There are 2 areas where agricultural use is concentrated - near Acadieville and Kouchibouguac.
Forestry Operations	8	Approximately 20 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	7	There are 3 commercial fisheries (eels, gaspereau, smelt).
Hydro and Dams	0	There are no hydroelectric developments on the river.
Mineral and Aggregate Resources	8	There are 2 quarry operations.

Management Feasibility Score 59.2

TABLE 6-8 - LITTLE SOUTHWEST MIRAMICHI RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	8	Approximately 80 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	8	There are 2 government jurisdictions along the river, provincial, federal.
Urbanization	8.9	Approximately 11 percent of the length of the river environment contains urban uses.
Linear Development	5	Approximately 50 percent of the length of the river environment is occupied by highways including 2 highway crossings.
Recreation/Conservation Use	1.44	There are 2 federal historic sites along the river, and one Indian Reserve.
Agricultural Activities	4.5	There is 1 area where agricultural use is concentrated, near Red Bank.
Forestry Operations	8.5	Approximately 15 percent of the length of the river has been disturbed by recent forestry operations.
Fisheries	9	There is 1 Native food fishery on the river.
Hydro and Dams	0	There are no hydroelectric developments on the river.
Mineral and Aggregate Resources	3	There are 7 quarry operations within the river environment.

Management Feasibility Score 56.3

TABLE 6-9 - MAGAGUADAVIC RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	3.2	Approximately 68 percent of the river environment is privately owned.
Jurisdictional Pattern	8	There are 2 government jurisdictions along the river - provincial and the Municipality of St. George.
Urbanization	8.1	Approximately 19 percent of the length of the river environment contains urban uses.
Linear Development	3.4	Approximately 66 percent of the length of the river environment is occupied by highways.
Recreation/Conservation Use	0	None.
Agricultural Activities	4	There are 2 areas where agricultural use is concentrated - near St. George and Bonny River.
Forestry Operations	3.2	Approximately 68 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	8	There are 2 commercial fisheries (eel, gaspereau).
Hydro and Dams	-2	There is 1 hydroelectric development at St. George.
Mineral and Aggregate Resources	4	There are 6 quarries in operation within the river environment.

Management Feasibility Score 39.9

TABLE 6-10 - NASHWAAK RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	4.8	Approximately 52 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	6	There are 4 government jurisdictions along the river - federal, provincial and the municipalities of Fredericton and Stanley.
Urbanization	6.5	Approximately 35 percent of the length of the river environment contains urban uses.
Linear Development	2.1	Approximately 79 percent of the length of the river environment is occupied by highways, 15 percent by transmission lines and 23 percent by railways. There are also 11 highway crossings, 6 transmission line crossings and 2 railway crossings.
Recreation/Conservation Use	0.42	There is 1 historic site (42nd Highland Cemetery at Taymouth) and an Indian Reserve.
Agricultural Activities	4	There are 2 areas of concentrated agricultural use - near Stanley and Durham Bridge.
Forestry Operations	7.7	Approximately 23 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	10	There is no fishery.
Hydro and Dams	0	There are no impoundments on the river.
Mineral and Aggregate Resources	0	There are 17 quarry operations within the river environment.

Management Feasibility Score 41.5

TABLE 6-11 - NEPISIGUIT RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	8.2	Approximately 82 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	8	There are 2 government jurisdictions, provincial and the Municipality of Bathurst.
Urbanization	9	Approximately 10 percent of the length of the river environment contains urban uses.
Linear Development	5.2	Approximately 48 percent of the length of the river environment is occupied by highways including 5 crossings, 5 transmission line crossings and 1 railway crossing.
Recreation/Conservation Use	1.5	There is 1 provincial park (Mount Carleton).
Agricultural Activities	4.5	There is 1 area where agricultural use is concentrated, near Bathurst.
Forestry Operations	9.1	Approximately 9 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	10	There is no fishery.
Hydro and Dams	-0.8	There is 1 hydroelectric development.
Mineral and Aggregate Resources	0	There are 24 quarry operations within the river environment.

Management Feasibility Score 54.7

TABLE 6-12 - NORTHWEST MIRAMICHI RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	5.5	Approximately 55 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	8.0	There are 2 government jurisdictions, federal and provincial.
Urbanization	7.8	Approximately 22 percent of the length of the river environment contains urban use.
Linear Development	5.6	Approximately 44 percent of the length of the river environment is occupied by highways including 5 crossings, 4 transmission lines and 1 railway.
Recreation/Conservation Use	0.26	There is 1 provincial park, 2 federal historic sites, and 2 Indian Reserves.
Agricultural Activities	4.5	There is 1 area where agricultural use is concentrated, near Red Bank.
Forestry Operations	8.4	Approximately 16 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	6.0	There are 3 commercial fisheries (eel, gaspereau, smelt) and a Native food fishery.
Hydro and Dams	0	There are no existing hydroelectric developments, but one is proposed for Mill Bank.
Mineral and Aggregate Resources	0	There are 10 quarry operations.

Management Feasibility Score 46.1

TABLE 6-13 - OROMOCTO RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	4	Approximately 60 percent of the length of the river environment is in private ownership.
Jurisdictional Pattern	7	There are 3 government jurisdictions along the river - federal, provincial and the Municipality of Oromocto.
Urbanization	8	Approximately 20 percent of the length of the river environment contains urban uses.
Linear Development	4.8	Approximately 52 percent of the river environment is occupied by highways including 7 crossings. Transmission lines occur along 23 percent of river environment with 4 crossings and rail lines occur along 29 percent of the river environment with 2 crossings.
Recreation/Conservation Use	2.74	There is 1 provincial park and a military reserve.
Agricultural Activities	5	There are no areas where agricultural use is concentrated.
Forestry Operations	9.6	Approximately 4 percent of the length of the river environment has been disturbed by recent forestry operation.
Fisheries	7	There are 3 commercial fisheries (eel, gaspereau, shad).
Hydro and Dams	0	There are no hydroelectric developments on the river.
Mineral and Aggregate Resources	4	There are 6 quarries in operation within the river environment.

Management Feasibility Score 52.1

TABLE 6-14 - PATAPEDIA RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	10	100 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	10	There is 1 government jurisdiction, provincial.
Urbanization	9.9	Less than 1 percent of the length of the river environment contains urban uses.
Linear Development	9.5	Approximately 5 percent of the length of the river environment is occupied by highways, there are no highway, rail or transmission line crossings.
Recreation/Conservation Use	9.8	Approximately 49 percent of the length of the river environment is within the Kedgwick Game Management Area.
Agricultural Activities	5	There are no areas of concentrated agricultural use.
Forestry Operations	10	There have been no recent forestry operations.
Fisheries	10	There is no fishery.
Hydro and Dams	0	There are no existing or proposed hydroelectric developments.
Mineral and Aggregate Resources	10	There are no mining or quarry operations.

Management Feasibility Score 84.2

TABLE 6-15 - PETITCODIAC RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	0.3	Approximately 97 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	2	There are 8 government jurisdictions along the river - federal, provincial and the municipalities of Moncton, Dieppe, Riverview, Hillsborough, Salisbury and Petitcodiac.
Urbanization	1	Approximately 90 percent of the length of the river environment contains urban uses.
Linear Development	0.4	Approximately 96 percent of the length of the river environment is occupied by highways, 15 percent by power transmission lines and over 30 percent by railway lines. There are also 7 highway crossings, 7 transmission line crossings and 2 railway crossings. There are also proposals for highway (TCH) construction and 2 power line corridors.
Recreation/Conservation Use	0.28	There is 1 historic site, an Indian reserve, and a military reserve.
Agricultural Activities	0	There are 10 areas where agriculture uses are concentrated - near Anagance, Hopewell Cape, Riverview, Hillsborough, Moncton, Fox Creek, River Glade, Petitcodiac, Salisbury and Dieppe.
Forestry Operations	9.4	Approximately 6 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	5	There are 5 commercial fisheries (eel, gaspereau, smelt, shad, sturgeon).

Hydro and Dams	-5.6	There are no hydroelectric developments but there is a large impoundment due to a causeway at Riverview.
Mineral and Aggregate Resources	8	There are 2 quarry operations.

Management Feasibility Score 20.8

TABLE 6-16 - PORTOBELLO RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	0.1	Approximately 99 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	8	There are 2 government jurisdictions, provincial and federal.
Urbanization	9.3	Approximately 7 percent of the length of the river environment contains urban uses.
Linear Development	6	Approximately 40 percent of the length of the river environment is occupied by highways including 8 crossings, 2 crossings by transmission lines and rail lines occupy 22 percent of the length of the river environment including one crossing.
Recreation/Conservation Use	10.6	A National Wildlife Area occupies about half of the river environment.
Agricultural Activities	4	There are 2 areas where agricultural use is concentrated - near Sheffield and Maugerville.
Forestry Operations	7.1	Approximately 29 percent of the length of the river environment has been affected by recent forestry operations.
Fisheries	9	There is a commercial fishery (eel).
Hydro and Dams	0	No hydroelectric development.
Mineral and Aggregate Resources	9	One quarry operation.

Management Feasibility Score 63.1

TABLE 6-17 - RESTIGOUCHE RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	4.0	Approximately 60 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	5	There are 5 government jurisdictions: 2 provincial and the Municipalities of Campbellton, Atholville and Tide Head.
Urbanization	9.3	Approximately 7 percent of the length of the river environment contains urban uses.
Linear Development	6.4	Approximately 36 percent of the length of the river environment is occupied by linear developments including 6 highway crossings, 1 transmission line crossing and 1 railway crossing.
Recreation/Conservation Use	0.91	Approximately 9 percent of the length of the river environment is occupied by the Kedgwick Game Management Area and there is 1 federal historic site (Battle of Restigouche).
Agricultural Activities	4.0	There are 2 areas of concentrated agricultural use, near Campbellton and Tide Head.
Forestry Operations	8.7	Approximately 13 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	9.0	There is a Native food fishery.
Hydro and Dams	0	There are no existing or proposed hydroelectric developments.
Mineral and Aggregate Resources	9	There is 1 quarry operation.

Management Feasibility Score 56.3

TABLE 6-18 - RICHIBUCTO RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	3.7	Approximately 63 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	6	There are 4 government jurisdictions, federal, provincial and the Municipalities of Richibucto and Rexton.
Urbanization	6.0	Approximately 40 percent of the length of the river environment contains urban uses.
Linear Development	3.7	Approximately 63 percent of the length of the river environment is occupied by highway including 4 crossings, 2 transmission line crossings and 1 railway crossing.
Recreation/Conservation Use	0.42	Approximately 2 percent of the length of the river environment is occupied by Kouchibouguac National Park and there is 1 historic site.
Agricultural Activities	4	There are 2 areas where agricultural use is concentrated, Richibucto and Rexton.
Forestry Operations	9	Approximately 10 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	7	There are 3 commercial fisheries (eel, gaspereau, smelt).
Hydro and Dams	0	There are no existing or proposed hydroelectric developments.
Mineral and Aggregate Resources	3	There are 6 quarry operations, as well as peat harvesting.

Management Feasibility Score 42.8

TABLE 6-19 - SAINT JOHN RIVER - LOWER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	1.5	Approximately 85 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	3	There are 7 government jurisdictions along the river - federal, provincial and the Municipalities of Saint John, Grand Bay, Westfield, Oromocto and Fredericton.
Urbanization	0.3	Approximately 97 percent of the length of the river environment contains urban uses.
Linear Development	0	100 percent of the length of the river environment is occupied by highways including 6 crossings, 17 percent of the length of the river environment is occupied by transmission lines including 6 crossings and 50 percent of the length of the river environment is occupied by rail lines including 2 crossings.
Recreation/Conservation Use	6	There are 4 provincial historic sites, 18 federal historic sites, 1 provincial park, 2 Indian reserves and CFB Gagetown within the river environment.
Agricultural Activities	0.5	There are 9 areas where agricultural activity is concentrated - near Fredericton, Oromocto, Maugerville, Gagetown, Hampstead, Westfield, Saint John, Douglas and Lincoln.
Forestry Operations	9.4	Approximately 6 percent of the length of the river environment has been recently disturbed by recent forestry operation.
Fisheries	4	There are 5 commercial fisheries (eel, gaspereau, shad, sturgeon, smelt) and a fish hatchery.
Hydro and Dams	0	There is a hydroelectric development at the head of this section, but no impoundments on this section.

Mineral and Aggregate Resources	0	There are 33 quarry operations.

Management Feasibility Score 24.7

TABLE 6-20 - SAINT JOHN RIVER - MIDDLE

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	1.0	Approximately 90 percent of the length of the river environment is under private ownership.
Jurisdictional Pattern	0	There are 12 government jurisdictions along the river: provincial, federal, and the Municipalities of Grand Falls, Aroostook, Perth-Andover, Bath, Bristol, Meductic, Florenceville, Hartland, Woodstock, Nackawic.
Urbanization	1.5	Approximately 85 percent of the length of the river environment that contains urban uses.
Linear Development	0	The entire length of the river environment is occupied by linear developments including 9 highway crossings, 17 transmission line crossings, and 2 railway crossings. In addition to these, approximately 4 highway crossings and 1 transmission line are proposed.
Recreation/Conservation Use	0.6	Approximately 3 percent of the length of the river environment: 4 provincial parks, 4 federal historic sites, 3 provincial historic sites, and an Indian Reserve.
Agricultural Activities	0	There are approximately 18 areas where agricultural use is concentrated.
Forestry Operations	8.7	There are recent forestry operations along approximately 13 percent of the length of the river environment.
Fisheries	9	There is 1 commercial fishery (eel).
Hydro and Dams	-13.6	There are 2 hydroelectric developments on this section of river (Beechwood, Mactaquac).

Mineral and Aggregate Resources	0	There are 55 quarry operations within the river environment.

Management Feasibility Score 7.2

TABLE 6-21 - SAINT JOHN RIVER - UPPER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	0	The entire length of the river is under private ownership.
Jurisdictional Pattern	0	There are 12 government jurisdictions along the river, two federal, provincial, state, and the Municipalities of Grand Falls, Saint Leonard, Edmundston, Sainte-Anne-de-Madawaska, Saint-Basile, Riviere-Verte, Baker Brook, and Claire.
Urbanization	0	The entire length of the river environment contains urban uses.
Linear Development	0	The entire length of the river environment is occupied by linear developments including 4 highway crossings and 2 railway crossings.
Recreation/Conservation Use	0	None.
Agricultural Activities	0	There are 11 areas where agricultural use is concentrated: Saint-Francois-de-Madawaska, Clair, Caron Brook, Baker Brook, Saint-Hilaire, Edmundston, Saint-Basile, Riviere-Verte, Saint-Anne-de-Madawaska, Saint-Leonard, Siegas.
Forestry Operations	9.2	Approximately 4 percent of the length of the river environment is disturbed by recent forestry operations.
Fisheries	10	There is no fishery.
Hydro and Dams	-7	There is a hydroelectric development at Grand Falls.
Mineral and Aggregate Resources	4	There are 6 quarry operations within the river environment.

Management Feasibility Score 16.2

TABLE 6-22 - SOUTHWEST MIRAMICHI RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	0.5	Approximately 95 percent of the length of the river environment is privately owned.
Jurisdictional Pattern	1.0	There are 9 government jurisdictions along the river: federal, provincial, and the Municipalities of Newcastle, Chatham, Doaktown, Douglastown, Blackville, Nelson-Miramichi, Loggieville.
Urbanization	5.6	Approximately 44 percent of the length of the river environment contains urban uses.
Linear Development	5.0	Approximately 50 percent of the length of the river environment is occupied by highways including 9 crossings, 36 percent by railways including 8 crossings, and 14 percent by transmission lines including 3 crossings. In addition, a transmission line is proposed for the Chatham area.
Recreation/Conservation Use	0.23	The river environment contains 2 provincial parks, 1 federal and 5 provincial historic sites, 1 Indian reserve and 1 military reserve.
Agricultural Activities	3	There are 7 areas of concentrated agricultural use: near Newcastle, Chatham, Blackville, Upper Blackville, Doaktown, Douglastown, Millerton.
Forestry Operations	8.6	Recent forestry operations have occurred along approximately 14 percent of the length of the river environment.
Fisheries	7	There are 3 commercial fisheries (eel, gaspereau, smelt).
Hydro and Dams	-0.08	There are no hydroelectric developments but there is a small impoundment used by a lumber mill at Juniper.

Mineral and Aggregate Resources 0 There are 25 quarry operations.

Management Feasibility Score 30.9

TABLE 6-23 - TETAGOUCHE RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	6.9	Approximately 69 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	8	There are 2 government jurisdictions along the river, provincial and the Municipality of Bathurst.
Urbanization	7.2	Approximately 28 percent of the length of the river environment contains urban uses.
Linear Development	3.4	Approximately 66 percent of the length of the river environment is occupied by highways including 5 crossings, 1 transmission line crossing and 1 railway crossing.
Recreation/Conservation Use	0	None.
Agricultural Activities	3.5	There are 3 areas where agricultural use is concentrated, near Bathurst, North Tetagouche and South Tetagouche.
Forestry Operations	9.2	Approximately 8 percent of the river environment has been disturbed by recent forestry operations.
Fisheries	10	There is no fishery.
Hydro and Dams	0	There are no hydroelectric developments.
Mineral and Aggregate Resources	1	There are 9 quarry operations.

Management Feasibility Score 49.2

TABLE 6-24 - TOBIQUE RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	2.1	Approximately 79 percent of the river environment that is privately owned.
Jurisdictional Pattern	7	There are 3 government jurisdictions along the river environment - federal, provincial and the Municipality of Plaster Rock.
Urbanization	5.7	Approximately 43 percent of the length of the river environment that is occupied by urban uses.
Linear Development	1.9	Approximately 81 percent of the length of the river environment is occupied by highways (7 crossings) and 14 percent by railway lines (1 crossing) and 2 percent by transmission lines (4 crossings).
Recreation/Conservation Use	1.3	One provincial park (Mount Carleton), an ecological reserve (No. 14), and an Indian Reserve.
Agricultural Activities	3.5	There are 3 areas of concentrated agricultural use - near Perth, Plaster Rock and Arthurette.
Forestry Operations	8.9	Approximately 11 percent of the length of the river environment has been disturbed by recent forestry operations.
Fisheries	9	There is a Native food fishery.
Hydro and Dams	-2.2	There is 1 hydroelectric development (Tobique Narrows - NB Power).
Mineral and Aggregate Resources	0	There are 11 quarry operations along the river.

Management Feasibility Score 37.2

TABLE 6-25 - UPSALQUITCH RIVER

MANAGEMENT CONSIDERATION	RATING	DESCRIPTION
Ownership Pattern	8.6	Approximately 86 percent of the length of the river environment is Crown Land.
Jurisdictional Pattern	9	There is 1 government jurisdiction, provincial.
Urbanization	8.6	Approximately 14 percent of the length of the river environment contains urban uses.
Linear Development	4.7	Approximately 53 percent of the length of the river environment is occupied by highways including 5 crossings, 1 transmission line crossing and 1 railway crossing.
Recreation/Conservation Use	0	None.
Agricultural Activities	5	There are no areas where agricultural use is concentrated.
Forestry Operations	9.4	Approximately 6 percent of the length of the river environment is disturbed by recent forestry operations.
Fisheries	10	There is no fishery.
Hydro and Dams	0	There are no hydroelectric developments.
Mineral and Aggregate Resources	8	There are 2 quarry operations within the river environment.

Management Feasibility Score 63.3

7.0 DETERMINATION OF POTENTIAL HERITAGE RIVERS

The determination of potential heritage rivers was based on an analysis of the foregoing assessments of river values and management feasibility.

As described previously, the outstanding value of Canadian Heritage Rivers is determined according to the three sets of guidelines established for natural heritage value, human heritage value, and recreational value. A nominated river may be included in the CHRS if it meets one or more of the heritage value guidelines, as well as a set of integrity guidelines.

Therefore, in determining which rivers have the greatest potential for nomination to the CHRS or those which merit consideration as provincially significant heritage resources, priority is placed on rivers which were evaluated to rank highly for the respective heritage value guidelines and had high integrity ratings.

In the context of management of rivers as heritage resources, the management considerations discussed in Chapter 6 could potentially have a large impact on the ease of management in new Brunswick. Therefore, management feasibility is an important factor for consideration in determining potential candidate rivers. However, management feasibility is considered secondary to heritage value.

7.1 River Values

The river value assessment results contained in Chapter 4 provide the basis of the analysis for choosing rivers which exhibit outstanding value for natural heritage, human heritage, and recreation. The multiple heritage values ranking provides the best overall representation of this.

For the purpose of determining the rivers with the greatest potential for nomination, the ten rivers with the highest ranking for multiple heritage values were chosen for further consideration. These include the Lower Saint John, Southwest Miramichi, Northwest Miramichi, Middle Saint John, Kennebecasis, Little Southwest Miramichi, Oromocto, Nashwaak, Richibucto, and Upper Saint John rivers. This list contains the most highly ranked rivers for each of the heritage value guidelines.

In order to refine the list of potential candidates to those with most significant heritage value, rivers which did not achieve a minimum ranking of third place for one of the respective heritage value guidelines were deleted. Those deleted include the Middle Saint John and Little Southwest Miramichi rivers.

The integrity ratings of each of the remaining rivers were reviewed to ensure that each met the minimum integrity requirements. As described in Section 2.6.5, the proportion of the river length possessing particular integrity values was assessed in order to allow for the possibility of excluding impacted sections from a nomination. This approach provides flexibility for considering rivers which have high heritage value but have relatively small sections in non-compliance with integrity guidelines and values. An integrity rating of 0.8 was adopted as the minimum for a river to be considered for nomination for one of the respective heritage value guidelines. All remaining rivers met this requirement. Potential heritage rivers are presented in Table 7-1.

Table 7-1 Potential Heritage Rivers

River	Heritage Value Guideline	Ranking	Integrity Rating
Lower Saint John	Natural	1	0.65*
	Human	1	0.93
	Recreation	7	1.0
Southwest Miramichi	Natural	2	0.86
	Human	3	0.92
	Recreation	6	1.0
Nashwaak	Natural	22	1.0
	Human	6	1.0
	Recreation	1	1.0
Northwest Miramichi	Natural	7	0.94
	Human	2	1.0
	Recreation	5	1.0
Kennebecasis	Natural	5	0.63*
	Human	9	0.92
	Recreation	2	1.0
Richibucto	Natural	19	1.0
	Human	11	1.0
	Recreation	2	1.0
Oromocto	Natural	3	0.9
	Human	12	1.0
	Recreation	6	1.0
Upper Saint John	Natural	20	0.5*
	Human	10	0.62*
	Recreation	3	1.0

* Does not meet minimum integrity rating requirement of 0.8.

7.2 Management Feasibility

It is obvious from the assessment of management feasibility in Chapter 6 that rivers are complicated entities to manage. The assessment provides an analysis of the salient concerns for the nominating and managing government to consider in choosing the most desirable candidate.

As part of the analysis for determining potential heritage rivers, the management feasibility scores were combined with heritage value scores, to assess the effect on the overall ranking. The impact varied from relatively little change to major changes in the ranking of rivers. This resulted in some rivers with low heritage values being highly ranked due to a very high management feasibility score. The converse of this also occurred where a river with high heritage value scored low because of the low management feasibility associated with it. From this it was evident that potential heritage rivers should be considered primarily for their respective heritage values.

The impact that ease of management will have on the final choice is uncertain. However, it is assumed that the nominating and managing government will work to resolve the potential management problems for rivers with outstanding heritage values.

The potential heritage rivers and associated management considerations are listed in Table 7-2.

Table 7-2 Management Considerations for Potential Heritage Rivers

River	Management Feasibility Ranking	Management Considerations
Lower Saint John	19	85 percent privately owned; 7 government jurisdictions; 97 percent contains urban uses; entire length has linear developments; 22 historic sites, 1 provincial park, 2 Indian reserves, CFB Gagetown; agricultural activity concentrated in 9 areas; 6 percent with recent forestry operations; 5 commercial fisheries and a fish hatchery; 33 quarry operations.
Southwest Miramichi	18	95 percent privately owned; 9 government jurisdictions; 44 percent contains urban uses; 50 percent has linear developments; 2 provincial parks, 6 historic sites, 1 Indian reserve, 1 military reserve; agricultural activities concentrated in 7 areas; 14 percent with recent forestry operations; 3 commercial fisheries; small lumber mill impoundment.
Nashwaak	15	52 percent privately owned; 4 government jurisdictions; 35 percent contains urban uses; 79 percent has linear developments; 1 historic site, 1 Indian reserve; agricultural activity concentrated in 2 areas; 23 percent with recent forestry operations; 17 quarry operations.
Northwest Miramichi	13	55 percent Crown Land; 2 government jurisdictions; 22 percent contains urban uses; 44 percent has linear developments; 1 provincial park, 2 historic sites, 2 Indian reserves; agricultural activity concentrated in 1 area; 16 percent with recent forestry operations; 3 commercial fisheries, 1 Native food fishery; 10 quarry operations.

Table 7-2 Management Considerations for Potential Heritage Rivers (cont.)

River	Management Feasibility Ranking	Management Considerations
Kennebecasis	21	94 percent privately owned; 11 government jurisdictions; 79 percent contains urban uses; 87 percent has linear developments; 3 historic sites; agricultural activities concentrated in 7 areas; 16 percent with recent forestry operations; 5 commercial fisheries, 1 aquaculture operation; 12 quarry operations and 1 mine.
Richibucto	14	63 percent privately owned; 4 government jurisdictions; 40 percent contains urban uses; 63 percent has linear developments; 1 national park, 1 historic site; agricultural activity concentrated in 2 areas; 10 percent with recent forestry operations; 3 commercial fisheries; 6 quarry operations, peat harvesting.
Oromocto	11	60 percent privately owned; 3 government jurisdictions; 20 percent contains urban uses; 52 percent has linear developments; 1 provincial park, 1 military reserve; 4 percent with recent forestry operations; 3 commercial fisheries; 6 quarry operations.
Upper Saint John	22	Entirely privately owned; 12 government jurisdictions; entire length has urban uses; entire length has linear developments; agricultural activity concentrated in 11 areas, 4 percent with recent forestry operations; hydroelectric development at Grand Falls; 6 quarry operations.

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APPENDIX A

GUIDELINES FOR THE SELECTION OF CANADIAN HERITAGE RIVERS

6. GUIDELINES FOR THE SELECTION OF CANADIAN HERITAGE RIVERS

These guidelines comprise Section 4 of the CHRS Objectives, Principles and Procedures and additional guidelines adopted by the Canadian Heritage Rivers Board in June 1989.

The Canadian Heritage Rivers System provides a vehicle for the recognition and conservation of those rivers deemed to be of outstanding Canadian heritage value. This value is obtained when it has been determined that a river is an outstanding representative of or unique in a province or territory. By the inclusion of such rivers in a single coast-to-coast system, they become representative of Canada's river heritage as a whole, thus reflecting a 'Canadian value'.

6.1 Principles

6.1.1 The outstanding value of Canadian Heritage Rivers shall be determined according to three sets of 'Heritage Value Guidelines':

- guidelines for natural heritage value,
- guidelines for human heritage value,
- guidelines for recreational value;

6.1.2 A nominated river shall be included in the Canadian Heritage Rivers System if it meets one or more of the 'Heritage Value Guidelines', as well as all 'Integrity Guidelines'.

6.1.3 While no formal limit shall be imposed either on the total number of rivers included in the System or on the number of rivers any individual jurisdiction can nominate at successive stages for inclusion, the purpose of the System is not to provide for the protection of all rivers of interest, importance or value, but only for the most outstanding of these from a Canadian viewpoint.

6.1.4 It is intended that the selection guidelines will be applied in a manner which will allow all of the provinces and territories of Canada to participate in the Canadian Heritage River System.

6.1.5 Should a Canadian Heritage River have deteriorated to such an extent that it has lost those characteristics for which it was originally designated or when further research has shown that the river is not, in fact, of outstanding Canadian value, that river shall be deleted from the System.

6.2 Natural Heritage Value Guidelines

6.2.1 **Natural Heritage Values.** Outstanding Canadian natural heritage value will be recognised when a river environment meets one or more of the following guidelines:

- Is an outstanding example of river environments as they are affected by the major stages and processes in the earth's evolutionary history which are represented in Canada. This would include rivers which best represent the major periods of geological time in which the surface of the earth underwent major changes and stream modification.

- Is an outstanding representation of significant ongoing fluvial, geomorphological and biological processes. As distinct from the periods of the earth's development this focuses upon ongoing processes in the evolution and form of the river and its associated plant and animal communities.

- Contains along its course unique, rare or outstanding examples of natural phenomena, formations or features, or areas of exceptional natural beauty.

- Contains along its course habitats of rare or endangered species of plants and animals. This would also include areas where outstanding concentrations of plants and animals of Canadian interest and significance are found.

6.2.2 **Natural Integrity Values.** In addition to meeting one or more of the above guidelines, for a river to be judged to have outstanding Canadian natural heritage value it must possess the following natural integrity values:

- Rivers should not have any man-made impoundments within the nominated section;

- All key elements and ecosystem components must be unaffected by impoundments located outside the nominated section;

- Natural values for which a river is nominated must not have been created by impoundments;

- The river's outstanding natural heritage features and key elements of ecosystems must be unimpaired by human land uses;

- The river's water must be uncontaminated to the extent that its natural aquatic ecosystem is intact.

6.3 Human Heritage Value Guidelines

6.3.1 Human Heritage Values. Outstanding human heritage value will be recognised when a river environment meets one or more of the following guidelines:

- Is of outstanding importance owing to its influence, over a period of time, on the historical development of Canada through a major impact upon the region in which it is located or beyond; this would include its role in such significant historical themes as native people, settlement patterns and transportations.
- Is strongly associated with persons, events, movements, achievements, ideas or beliefs of Canadian significance.
- Contains historical or archaeological structures, works or sites which are unique, rare or of great antiquity.
- Contains outstanding examples or concentrations of historical or archaeological structures, works or sites which are representative of major themes in Canadian history.

6.3.2 Historical Integrity Values. In addition to meeting at least one of the above guidelines, for a river to be judged to have outstanding Canadian human heritage value, it should possess all of the following historical integrity values:

- In every case consideration should be given to the state of preservation of the river environment relative to its visual appearance during the historic period in which the waterway is considered to be of outstanding importance:
  - most of its regime should have the same visual appearance as it had during the period of the river's historical importance; and
  - most of the artefacts comprising the values for which the river is nominated must be unimpaired by impoundments and human land uses.

- neighbouring land uses must not seriously affect the historical experience offered by the river environment; and
- the biophysical quality of the water must be suitable for non-contact recreation.

6.4 Recreational Value Guidelines

6.4.1 Recreational Values. Recognising the man-land relationship essential to recreation, outstanding recreational value will be recognised when a river environment meets the following general guidelines:

- Possesses an appropriate combination of recreational opportunities and related natural values which together provide a capability for an outstanding recreational experience:
  - Recreational opportunities include such activities as boating, hiking, swimming, camping, wildlife viewing, and human heritage appreciation;
  - Natural values include natural visual aesthetics, that is, diversity and quality of scenic beauty and physical essentials, such as sufficient flow, navigability, rapids, accessibility and suitable shoreline;
- Be capable of supporting recreational uses without significant loss of or impact on its natural, historical or aesthetic values.

6.4.2 Recreational Integrity Values. In addition to meeting both of the above guidelines, for a river to be judged to have outstanding Canadian recreational value it should possess water of a quality suitable for those recreational opportunities for which it is nominated.

6.5 General Integrity Guidelines

In addition to the specific heritage value and integrity guidelines, a river and its immediate environment must meet general integrity guidelines for designation to the Canadian Heritage Rivers System:

- They should be of sufficient size and contain all or most of the key inter-related and inter-dependent elements* to demonstrate the key aspects of the processes, features, activities or other phenomena which give the river its outstanding value;

- They should contain those ecosystem components required for the continuity of the species, features or objects to be protected;
- The quality of the water should be such as to provide for the continuity and/or improvement of the resource upon which 'value' to the system has been determined.

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* Elements are defined as resources or groupings of resources identified as having values essential to the nomination of a river.

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APPENDIX B

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APPENDIX C
STUDY RIVER BOUNDARIES

STUDY RIVERS AND THEIR BOUNDARIES

CAINS RIVER

One km west of the western boundry of the Bantalor Game Management Area, to the Southwest Miramichi River

DUNGARVON RIVER

From a small lake at the headwaters of the South Branch, approximately 1 km west of the York-Northumberland county line and 200 meters south of Highway 108 to the Renous River

EEL RIVER

From First Eel Lake to the Saint John River

KEDGWICK RIVER

The North Branch from the NB-Que border to the Restigouche River

KENNEBECASIS RIVER

From 1 km southeast of Hamilton Lake to the Saint John River

KOUCHIBOUGUAC RIVER

West of Highway 126, in an area of wetlands just east of the Huskisson Parish line, to the Kouchibouguac Lagoon

LITTLE SOUTHWEST MIRAMICHI RIVER

From Glover Lake to the confluence of the Northwest Miramichi River

MAGAGUADAVIC RIVER

From Magaguadavic Lake to St. George

NASHWAAK RIVER

From Nashwaak Lake to the Saint John River

NEPISIGUIT RIVER

From where the river leaves the easternmost of Nepisiguit Lakes to Bathurst Harbour

NORTHWEST MIRAMICHI RIVER

From the headwaters between Chief's Moutain and Mount Acquin to the confluence of the Southwest Miramichi River

OROMOCTO RIVER

The south branch, from South Oromocto Lake to the Saint John River

PATAPEDIA RIVER

From where the river begins to form the NB-Que. border to the Restigouche River

PETITICODIAC RIVER

From the confluence of the North and Anagance Rivers to Fort Folly Point

PORTOBELLO RIVER

At Noonan, .7 km north of Highway 10 in Sunbury County to the mouth at the Narrows, across from Sand Point at the junction of Indian and French Lakes

RESTIGOUCHE RIVER

From the headwaters of the Little Main Restigouche, 1km west of Four Mile Brook and south of Caribou Brook to Campbellton

RICHIBUCTO RIVER

Approximately 12.5 km west of Mortimer, to Richibucto Harbour

SAINT JOHN RIVER - LOWER

From Mactaquac Dam to Saint John Harbour

SAINT JOHN RIVER - MIDDLE

From Grand Falls to Mactaquac Dam

SAINT JOHN RIVER - UPPER

From the mouth of the St.Francis River to Grand Falls

SOUTHWEST MIRAMICHI RIVER

From the source of the south branch of the Southwest Miramichi, 1 km southwest of the fire tower at Brighton Mountain, to Sheldrake Island

TETAGOUCHE RIVER

From .5 km west of Caribou Mine (MGR986724) to Bathurst Harbour

TOBIQUE RIVER

From Nictau Lake to the Saint John River

UPSALQUITCH RIVER

The Northwest Upsalquitch River, from the headwaters, 1 km due north of the radio tower which is some 6 km due east of Five Fingers on Route 260 to the Restigouche River

APPENDIX D

GEOLOGICAL TIME SCALE

Era	Period	(Epochs)	Time began *
CENOZOIC	QUATERNARY	(Holocene)	
		(Pleistocene)	2
		(Pliocene)	
		(Miocene)	25
	TERTIARY	(Oligocene)	
		(Eocene)	
		(Palaeocene)	65
MESOZOIC	CRETACEOUS		136
	JURASSIC		190
	TRIASSIC		225
PALAEOZOIC	PERMIAN		280
	CARBONIFEROUS	(PENNSYLVANIAN)	325
		(MISSISSIPPIAN)	345
	DEVONIAN		395
	SILURIAN		430
	ORDOVICIAN		500
	CAMBRIAN		570
PRECAMBRIAN			4600

* Figures in this column represent millions of years .

GEOLOGICAL TIME SCALE

APPENDIX E

HERITAGE VALUE SCORING PROCEDURE

SCORING PROCEDURE FOR NATURAL AND HUMAN HERITAGE VALUES
Example - Nashwaak River

	Step	Natural Heritage Values	Human Heritage Values
1.	Apply criteria to evaluate and score sub-components.		
2.	Natural Heritage Values only; apply adjustment factor to water quality sub-component.	Water Quality Score = 8 Adjustment Factor = 1 8 x 1 = 8	
3.	Add the sub-component values within a component, if they exist.	Development = 4 Features = 5 9	
		Flow Pattern = 7 Water Quality = 8 15	
		Features = 8 Alteration = 4 12	
4.	Divide the sum of the sub-component values by the number of sub-components. This represents the value for the component.	Surficial Geology 9 - 2 = 4.5	
		Hydrology 15 - 2 = 7.5	
		Vegetation 12 - 2 = 6	

.../2

	Step	Natural Heritage Values		Human Heritage Values	
5.	Add the components within a category	Physiography	7.0	Native People	6
		Bedrock Geol.	9.0	Settlement Patt	10
		Palaeotology	2.5	Transportation	4
		Surficial Geol.	4.5		20
			23.0		
		Hydrology	7.5		
		Morphology	6.0		
		Vegetation	6.0		
		Wildlife	7.0		
			26.5		
		Features	8.0		
		Alteration	4.0		
			12.0		
6.	Divide the sum of the component values within a category by the number of components within the category. This gives the value for the category.	Geological Development 23 - 4 = 5.8		Historical Development 20 - 3 = 6.7	
		Ongoing Processes 26.5 - 4 = 6.6			
		Natural Beauty 12 - 2 = 6			

.../3

	Step	Natural Heritage Values		Human Heritage Values	
7.	Add the categories within a theme	Geol. Development	5.8	Hist. Development	6.7
		Ongoing Processes	6.9	Persons/Concepts	5.0
		Natural Phenomena	7.0	Rare Finds	7.0
		Natural Beauty	6.0	Themes in Cnd. History	5.0
		Biota	8.0		
			33.7		23.7
8.	Human Heritage Theme only; apply adjustment factor for state of preservation.			Human Heritage	= 23.7
				Adjustment Factor	= 0.9
				22.7 x 0.9 = 21.3	
9.	Multiply Human Heritage Values by 1.25 so all themes are scored out of 50 points	Theme: Natural Heritage	33.7	Theme: Human Heritage 21.3 x 1.25 = 26.6	

SCORING PROCEDURE FOR NATURAL AND HUMAN HERITAGE VALUES

Example - Nashwaak River

	Step	Recreational Values	
1.	Apply criteria to evaluate and score sub-components		
	Steps 2 to 4 apply to Capabilities Category		
2.	Apply adjustment factor to selected sub-components	Canoe-Kayaking	= 5
		Weight	= 2
		5 x 2	= 10
		Hunting	= 9
		Weight	= .5
		9 x .5	= 4.5
3.	Add the sub-component values within the capabilities category	Capabilities	
		Canoe-Kayaking	10
		Sport Fishing	10
		Hunting	4.5
		Intensive Recreation	9
		Human Heritage Appreciation	7
		Scenic Beauty	9
		Solitude/Backcountry	5
		Waterflow	7
		Navigability	6
		Access	7
		Water Quality	10
		Shoreline	8
			93.5

	Step	Recreational Values
4.	Divide the sum of the sub-component values by the maximum possible score. This represents the value for the capabilities category.	Capabilities 93.5 ÷ 125 = .74 or 7.4 out of 10
5.	Steps 5 and 6 apply to Impacts/Sensitivities category.	Physical/Ecological Impacts = 9 Social/Psychological Impacts = 9 18
6.	Divide the sum of the sub-component values by the number of sub-components. This represents the value for the component and for the category.	Sensitivity to Human Use 18 ÷ 2 = 9
7.	Add the categories within a theme.	Capabilities = 7.4 Impacts/Sensitivities = 9 16.4
8.	Multiply recreational values by 2.5. All themes are scored out of 50 points.	Theme 16.4 x 2.5 = 41

APPENDIX F

RECREATIONAL QUESTIONNAIRE

RECREATION CHECKLIST
RIVER:

SOURCES:

NOTES:

CANOEING/KAYAKING

Trip length	-what is the possible trip length 1 day 2-5 days >6 days
Comments	
Skill	-according to the international scale of river difficulty, which skill levels are required to canoe the river class I, class II, class III, class IV, class V
Comments	
Water conditions	-in general, on the river are there substantial areas of; flat water moving water
Comments	
Camping	-including existing and potential sites, what is the approximate number of overnight camping locations available for canoeists -could camp location dispersal be best described as being at; regular intervals, somewhat regular intervals, or irregular intervals
Comments	
Portages	-are there any areas where portages are necessary on the river (dragging due to low water conditions not included) -if so, where are they located -what is the condition of the portage (excellent, good, poor) - what is the length of the portage; short < 100 meters, medium 100-500 meters, or long > 500 meters
Comments	

SPORT FISHING

Populations	-which of the following species exist in the river, but the population is not adequate for sport fishing -which of the following species are stocked -which of the following species is estimated as being adequate to support sport fishing Alantic salmon, brook trout, smallmouth bass pickerel, list other species
Comments	

HUNTING

Populations	-which of the following species exist in the river environment -which of the following species exist in the river environment in a population that is estimated as being adequate for hunting -hunting of which of the following species is permitted Moose, white tailed deer, black bear, small game, water fowl, list other species
Comments	

INTENSIVE RECREATION

Land Based Activities	-potentially which of the following could be carried out in the river environment birdwatching, picnicing, nature study/appreciation etc., cycling, hiking, beach activities,cross country sking, camping, auto touring, hunting, other-list
Comments	
Water Based Activities	-potentially which of the following could be carried out on the river swimming, sailing large craft, sailing small craft, large power craft, small power craft, water skiing, windsurfing, tubing/white water rafting, canoeing, fishing, other list
Comments	

6.

PHYSICAL FACTORS	
Water Flow	-how many months of the year is the river flow sufficient to allow navigation -is this dependable from year to year
Comments	
Navigbility	-in terms of navigation, are the following best described as frequent, occasional or rare; rocks, logs/logjams, hydro dams, beaver dams, weirs, impoundments sandbars, list any other obstacles
Comments	
Access	-the number of road access points along the river can best be described as; frequent, occasional or rare -the number of launching points for large craft (power or sail) can best be described as frequent, occasional or rare -the number of launching point for small craft (canoes and small power boats) can best be described as; frequent, occasional, or rare
Comments	
Water Quality	-which of the following factors are suitable for recreational contact activities; color, odor, aquatic vegetation, solid waste, turbidity -which of the following factors are suitable for recreational non-contact activities; color, odor, aquatic vegetation, solid waste, turbidity
Comments	
Shoreline	-interms of boat launching, swimming, or other recreational activities is the shoreline suitable for; parking, development of trails, camping areas, beaches -would drainage be a problem -would shoreline vegetation best be described as dense bush, lightly treed, brush and grass -would the slope of the shoreline best be described as steep, gentle or flat
Comments	

HISTORICAL/CULTURAL APPRECIATION

Active Sites	- indicate whether or not any of these site types occur within the river environment and how many.
Marked Sites	- indicate whether or not any of these site types occur within the river environment and how many (example, sites that are marked and have a plaque).
Visible Sites-no signage	- indicate whether or not any of these site types occur within the river environment and how many (such as historic buildings).
Invisible Sites	- indicate whether or not any of these site types occur within the river environment and how many (example, archaeological sites).
Comments	

NATURAL VALUES

Scenic Beauty	-flora; are there diverse examples, examples of unique species, or situations of floral beauty in the river environment -fauna; are there examples of rare or unique species, or are animal sightings common in the river environment -landscape; does the landscape include diverse patterns, have striking, interesting landform features, unique or attractive vistas or overlooks, are there waterfalls, cliffs etc. present in the river environment
Comments	

WILDERNESS/BACKCOUNTRY

Human contact	-is the potential of contact with other parties per day low (0-3), medium (4-10) or high (>10)
Comments	
Evidence of Human Existence or Interference	-do the following exist in the river environment; structures, industry, litter, pollution, hydro wires, noise from roads or industry, visible roads or bridges
Comments	

SENSIVITY TO HUMAN USE

Physical/ecological Impacts

-will human use cause serious negative impact to the following; vegetation, erosion, compaction, water quality, wildlife, significant natural or historical sites

Comments

Social/Psychological Impacts

-is there sufficient space in the river environment for various groups to carry out activities without over crowding or without user group conflict

-list major activities

Comments

NOTE:

Prior to questionnaires being sent to respondents, telephone contact was made to explain purpose of proposal, etc.

Volume

2

WASHBURN & GILLIS ASSOCIATES LTD.

RIVER SYSTEMS PLANNING STUDY FOR SELECTED RIVERS IN NEW BRUNSWICK

VOLUME II

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

PREPARED FOR: NEW BRUNSWICK DEPARTMENT OF TOURISM, RECREATION & HERITAGE

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Mrs. Barbara Yerxa
Tourism, Recreation & Heritage
P.O. Box 12345
Fredericton, NB
E3B 5C3

Dear Mrs. Yerxa:

We are pleased to submit the final report "River Systems Planning Study for Selected Rivers in New Brunswick - Volume II. This report contains a summary of the project phases conducted during the study and the conclusions reached. It also provides recommendations for rivers meriting consideration for nomination to the Canadian Heritage Rivers System or as provincial heritage resources.

We trust that you will find this report meets your requirements and we would be pleased to discuss it with you at your convenience.

Yours truly,

Robert Hutt

Robert Hutt, P.Eng.
Vice-President

DH/amm

Enclosure

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1.0 INTRODUCTION

1.1 Background

New Brunswick is endowed with a large number of rivers, many of which have clear and clean water and flow naturally through very beautiful countryside. The Province has long been recognized for the quality of its rivers. Rivers such as the Restigouche, Miramichi and the Saint John are internationally renowned for exceptional Atlantic salmon angling.

New Brunswick was one of the first provinces to be settled in Canada and its rivers have been used extensively during the process of development and urbanization. They have been used as a source of water supply, for transportation and for disposal of domestic, municipal and industrial wastes. Their courses and regimes have been altered for navigation and hydroelectric development, and the natural resources in and around them have been harvested. As a result, some of New Brunswick's rivers have been subjected to stresses of many types.

Recently, increases in multiple-use conflicts (i.e., fishing versus canoeing, industry versus recreation) have become more frequent, with various groups calling for conservation and management. This is partly due to increased participation in recreational activities, allowing more personal contact with the natural environment. This has given rise to an increase in public awareness and interest in the environmental condition and the impact of man's encroachment upon the environment.

The results of a U.S. Travel Market Study published by Tourism Canada in 1986 indicated that outdoor recreation was one of the Province's main attractions. As wilderness areas in the United States and other provinces experience increased utilization, it is anticipated that outdoor enthusiasts will look to New Brunswick in greater numbers.

In response to the importance of the Province's river systems and the potential for increased stress, the New Brunswick Department of Tourism, Recreation and Heritage, in cooperation with the Canadian Parks Service, Department of the Environment, initiated a river systems planning study for twenty-four preselected rivers or river sections in New Brunswick. The study evaluated these rivers as potential candidates for nomination to the Canadian Heritage Rivers System (CHRS) and those which may possess qualities suitable to be deemed provincially significant heritage resources.

The CHRS was established in 1984 with two principal objectives. The objectives of the CHRS are to give national recognition to important Canadian rivers and to ensure their future management such that:

- the natural heritage which they represent is conserved and interpreted;
- the human heritage which they represent is conserved and interpreted;
- the opportunities they possess for recreation and heritage appreciation are realized by residents of and visitors to Canada.

As a means of achieving these objectives, three sets of heritage value guidelines have been established for the selection of Canadian Heritage Rivers. The selection guidelines for natural heritage value, human heritage value, and recreational value provide requirements which must be met in order for a nominated river to be included in the CHRS. A nominated river may be accepted by the Canadian Heritage Rivers Board if it meets one or more of the selection guidelines and a set of integrity guidelines (Parks Canada, 1984; redrafted guidelines adopted June 14, 1989, see Appendix A). Collectively, these guidelines provide an excellent vehicle to examine rivers for their natural and historical significance, their recreational potential, and to identify management and development alternatives.

The river systems planning study has been undertaken in four phases:

Phase I	Development of a River Classification and Rating System for Heritage and Recreational Values;
Phase II	Heritage and Recreational Values Assessment;
Phase III	Management Feasibility and Implications; and
Phase IV	Summary, Conclusions and Recommendations.

Volume I contains a synthesis of Phases I - III and serves as the study background document in which the basis is established for the summary, conclusions and recommendations presented in Phase IV which is contained in this volume.

Subsequent chapters of this volume contain:

- a summary of the preceding study phases which were integrated in Volume I;
- conclusions reached based on the evaluation of heritage and recreational values, integrity values, and management feasibility of study rivers;
- recommendations for rivers meriting further consideration as potential candidates for nomination to the CHRS or Provincially significant heritage resources, management options, and future studies.

1.2 Study Rivers

Twenty-four rivers or river sections have been evaluated as to their natural heritage, human heritage, recreational, and integrity values, and management feasibility. The twenty-four study rivers are:

- Cains
- Dungarvon
- Eel
- Kedgwick

- Kennebecasis
- Kouchibouguac
- Little Southwest Miramichi
- Magaguadavic
- Nashwaak
- Nepisiguit
- Northwest Miramichi
- Oromocto
- Patapedia
- Petitcodiac
- Portobello
- Restigouche
- Richibucto
- Saint John - Lower
- Saint John - Middle
- Saint John - Upper
- Southwest Miramichi
- Tetagouche
- Tobique
- Upsalquitch

The locations of these rivers are shown in Figure 1.

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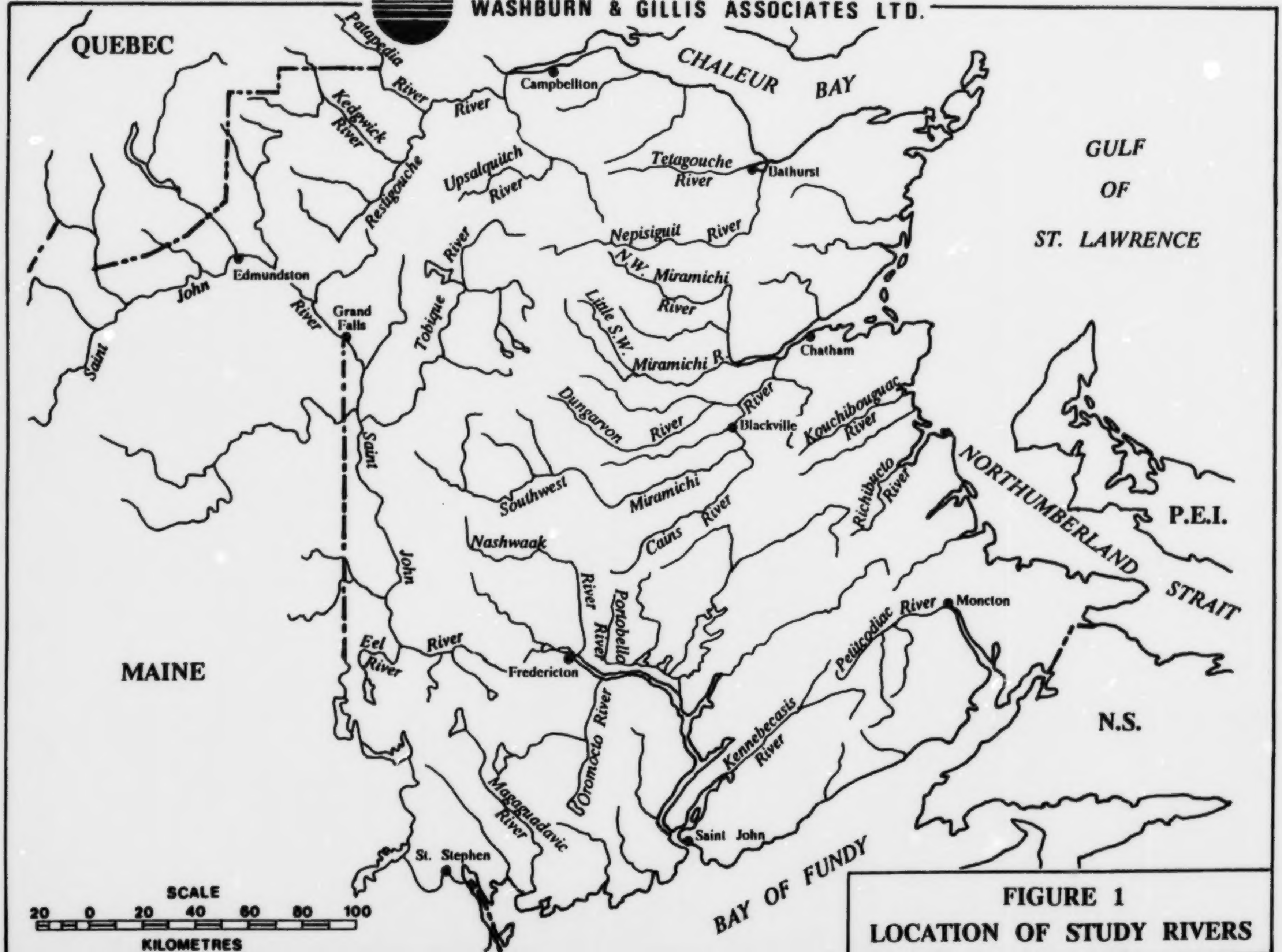

FIGURE 1
LOCATION OF STUDY RIVERS

1.3 Study Objectives

The primary objective of this study was to develop and implement a systematic method for selecting rivers in New Brunswick which merit special consideration for nomination to the CHRS, and merit possible further consideration as significant provincial heritage resources. Through the application of this method the natural heritage values, human heritage values, recreational values and the integrity associated with each of these were evaluated and documented for each of the study rivers.

The second objective was to assess the management feasibility of each river by determining and evaluating various issues which affect the potential for rivers to be managed, consistent with the CHRS objectives and Provincial policies.

The consequential ranking of the rivers has been prepared to provide a management tool to assist the Province in outlining priorities with respect to the management of rivers and determining which rivers warrant further study for possible nomination into the CHRS.

1.4 Study Process

In Phase I, the systematic approaches employed in other CHRS studies (Baker, 1984; Juurand, 1986; Rutherford, 1986; Halfyard, 1987) were reviewed and used as guides in defining certain themes and ratings for New Brunswick rivers. This, combined with information gathered from a review of additional literature, formed the basis for developing a checklist of factors to be considered in assessing heritage, recreational, and integrity values of the twenty-four study rivers. The evaluation criteria were developed specifically for New Brunswick rivers, but reflect the CHRS selection guidelines.

In Phase II, information on all significant natural heritage, human heritage, and recreational values relevant to the twenty-four study rivers was compiled and evaluated. Data were collected from a wide range of sources. These included published and unpublished reports, land use and resource maps, files from various government departments and research institutions, personal interviews with individuals from government departments, universities, and specialists from the New Brunswick Museum, and questionnaires distributed to knowledgeable individuals.

The rating criteria developed in Phase I were applied to evaluate and score the data compiled in Phase II. The rivers were ranked according to the scores achieved for natural heritage, human heritage, recreational, and multiple (combined) values. Following this ranking, the general integrity guidelines were applied to each river to determine if the conditions set out could be met, and that the river possessed the specific integrity values for natural heritage, human heritage, and recreation.

In Phase III, a study of management options and implications associated with managing rivers in New Brunswick was conducted. This involved a literature review of relevant reports and government documents; interviews with individuals who have jurisdictional interest in water and land management as it relates to heritage rivers and individuals from various government agencies and management commissions; and a review of applicable federal and provincial regulatory legislation and their adequacy for the protection and management of heritage rivers in New Brunswick. Management considerations were identified and evaluation and rating criteria were developed to assess and rank the management feasibility of each river. The assessment of management feasibility was based on existing and projected (within approximately 10 years, where information was available) land and water use within the river environment.

2.0 SUMMARY OF STUDY PHASES

This chapter contains a summary of the various study components which comprised the three previous study phases. For more detailed background information, the reader is directed to Volume I.

2.1 River Values Classification System Development

The classification and rating system was developed to reflect the CHRS selection guidelines and to apply specifically to the New Brunswick situation. The system devised for this study is a modification of systematic approaches employed in other CHRS studies. It consists of the thematic organization of major natural, human and recreational features and relationships relating to heritage river values, consistent with the selection guidelines.

The CHRS heritage value guidelines provided the basis for theme identification and the development of criteria for evaluating the heritage values of study rivers. Each of natural heritage, human heritage, and recreational values are considered as themes. The heritage value guidelines under each of these themes are considered as theme categories. Each category is comprised of various components and sub-components which address the requirements of the particular guideline to which they apply.

The heritage value guidelines state that outstanding Canadian natural heritage value, human heritage value, or recreational value will be recognized when a river environment meets the requirements of the respective guidelines. In this study, the river environment was considered to include the river channel, the valley floor, and the valley wall to the crest.

2.1.1 Natural Heritage Value

For the purpose of assessing New Brunswick rivers for outstanding natural heritage, four value categories were chosen:

(i) Geological Development - Several components were evaluated to determine which rivers best represent the major periods of geological time in which the surface of the earth underwent major changes and stream modification. The evaluation focused on both physiography and geology, as they relate to the study rivers.

For physiography, the evaluation focused on the number of different physiographic regions represented in the river environment.

The evaluation of representation of geologic time in river environments was based on bedrock geology, paleontology, and surficial geology. The evaluation of bedrock geology focused on the geologic age of rocks in the river environment. For paleontology, the evaluation focused on the presence and abundance of known fossils and their uniqueness or rarity. For surficial geology, consideration was given to the various stages of surficial development, associated deposit types, and the resultant physical features represented in the river environment. The evaluation focused on the diversity of glacial and post-glacial deposits, glacial and post-glacial history, and other types of surficial features represented in the river environment.

(ii) Ongoing Processes - As distinct from the periods of the earth's development, components for evaluation within this category focused on ongoing physical and biological processes relevant to the evolution and form of the river and its associated plant and animal communities.

River features assessed under physical processes in the evaluation system included hydrology, water quality, and morphology. For hydrology, the evaluation focused on outstanding representation of flow pattern characteristics and unusual or significant hydrologic characteristics associated with rivers of various size in the context of the regions in which they occur. For water quality, the evaluation focused on the representation of natural water quality characteristics associated with the region in which the river occurs, the diversity of natural water quality conditions along the river, and compliance of selected parameters with water quality guidelines for protection of freshwater aquatic life. For morphology, the evaluation focused on the outstanding representation of particular morphological features and diversity of these occurring in the river environment.

The evaluation of biological processes considered the vegetation and wildlife communities in the river environment. For vegetation, the evaluation focused on the variety of forest ecoregions, the natural state of the vegetation, and the extent of wetlands represented in the river environment. For wildlife, consideration was given to species which are river-dependent or are strongly associated with the river environment, including fish, mammals, and birds. The evaluation focused on the diversity of river-dependent species, those strongly associated with the river environment, and habitat.

(iii) Natural Phenomena/Natural Beauty - Although these are included under the same guideline, it has been interpreted as two guidelines in one, and natural phenomena and natural beauty have been considered independently. For natural phenomena, the evaluation focused on the outstanding representation, abundance, and diversity in the river environment. For natural beauty, the evaluation focused on representation of highly distinguishable landforms/landscape, varied vegetation patterns, natural phenomena, opportunity for observing features within the river environment, and its natural state.

(iv) Biota - Under this category, consideration was given to species considered to be rare, endangered, or threatened, and concentrations of species within the river environment. The evaluation focused on the presence of species declared under the New Brunswick Endangered Species Act and species otherwise considered rare, endangered or threatened and their relative abundance in the river environment. For species concentrations, the evaluation focused on the number of river-dependent species and species strongly associated with the river, found to be concentrated in the river environment.

2.1.2 Human Heritage Value

For the purpose of assessing New Brunswick rivers for outstanding human heritage, four value categories were chosen:

(i) Historical Development - The evaluation of the historical development of the study rivers considered native peoples, settlement patterns and transportation.

For native peoples, the evaluation focused on the presence of archaeological sites from various periods, and the density and significance of those sites; the number, variety, and significance of religious, ceremonial, or mortuary sites, settlements, and locations of important events; and the degree to which the river played a role in prehistoric transportation and trade networks.

For settlement patterns, the evaluation focused on the existence, significance, variety, and numbers of trading locations, military establishments, preferred agricultural areas, junctions of transportation routes, and locations along a transportation route, and industrial or commercial centres that are associated with the development of a community in the river environment; the association of the river environment with the entry, exit or settling area for significant numbers of a cultural or other important group; numbers and significance of sites of scientific, military, and resource procurement.

The evaluation of transportation focused on the importance of the river in terms of transportation of people and/or goods between North America and Europe, and within the Province; the association of the river with shipbuilding or a distinct vessel type; the occurrence of shipwrecks, transportation-related artifacts, and settlements that developed due to their location on transportation routes.

(ii) Person/Concepts - This category relates to the development of the character of the river and the evaluation focused on the importance of the strength of associations between the river and particular persons or concepts, and the number and variety of associations on a river.

(iii) Rare Finds - The evaluation of this category focused on prehistoric and historic sites that are of provincial significance due to their antiquity or uniqueness; the number, variety, and significance of known artifact collections, archaeological features, artifact scatters, and isolated finds.

(iv) Themes in Canadian History - The evaluation focused on examples of structures, works, and sites that are typical of major Canadian and New Brunswick historical themes; the significance, number, and variety of site types present in the river environment.

2.1.3 Recreational Value

For the purpose of assessing New Brunswick rivers with outstanding recreational value, two categories were chosen:

(i) Capabilities - Three components were evaluated to determine the extent to which river environments may be considered outstanding, including range of appropriate activities, natural values, and physical factors.

Range of appropriate activities considered canoeing/kayaking, sport fishing, hunting, intensive recreation, and human heritage appreciation. For canoeing/kayaking the evaluation focused on the length of trip possible, skill levels required, availability and spacing of campsites, and the presence of portages where necessary. The evaluation of sport fishing focused on the variety of sport fish species occurring in the river and the adequacy of population to support angling. The evaluation of hunting focused on the variety of game available in the river environment, provisions of access to hunting areas by the river, and the adequacy of populations to support hunting. For intensive recreation, the evaluation focused on the variety of activities possible and the potential for these activities along the length of the river. The evaluation of human heritage appreciation focused on the number of sites along the river and their potential for visitor appreciation.

Natural values considered natural attractions and solitude/backcountry. The evaluation of natural attraction focused on the variety and/or uniqueness of landforms, opportunities for viewing rare or endangered species, and/or exceptionally striking, beautiful, or unique flora or fauna. The evaluation of solitude/backcountry focused on opportunities for, and the perception of solitude; the absence of manmade structures, etc; and the absence of litter/pollution.

Physical factors were evaluated with consideration given to the type and nature of activities for which a river has the best potential. These included water flow, navigability, access, water quality, and shoreline. The evaluation of water flow focused on the depth, speed, and width of a river and dependability of flow. The evaluation of navigability focused on the number and type of obstacles and their limitation on navigability. The evaluation of access focused on dispersal of access points and the suitability of potential launching areas for crafts of various sizes along the river. The water quality evaluation focused on the colour, odour, extent of aquatic vegetation, presence of solid waste, and turbidity. For shoreline, the evaluation focused on slope, vegetation, drainage, and terrain for a range of recreational activities along the river.

(ii) Impacts/Sensitivities - Two components were evaluated to determine the capability of rivers to support recreational uses without significant loss of, or impact on, their natural, historical, or aesthetic values. The components include physical/ecological impacts and social/psychological impacts. The evaluation of physical/ecological impacts focused on existing and/or potential impacts on the natural, historic, and/or aesthetic environment. The evaluation of social/psychological impacts focused on availability of space for the major activities and the potential for conflict between user groups.

2.1.4 River Integrity

In order for a river to be included in the CHRS it must meet one or more of the heritage value guidelines plus a set of integrity guidelines. The general integrity guidelines provide direction in evaluating study rivers with respect to: being of appropriate size and containing key elements to demonstrate key aspects of processes, features, activities or other phenomena associated with the outstanding value of a river; required ecosystem components; and water quality.

In addition to meeting the heritage value guidelines and general integrity guidelines, a candidate river must possess specific integrity values related to each of the heritage value selection guidelines. Each study river was assessed for integrity by evaluating the proportion of the river that meets the integrity guidelines and possesses the specific natural, historical, or recreational integrity values.

2.2 River Values Scoring Criteria

Classification and rating statements were developed for the categories, components, and sub-components comprising the natural heritage, human heritage, and recreational value themes. The theme values scoring criteria are described in detail in Chapter 3 of Volume 1.

Study rivers were also assigned an integrity rating, based on the portion of the river length which appeared to meet the integrity guidelines and possessed the necessary natural, historical, or recreational integrity values. The ratings resulting for each of these were considered to be additive for the sections of river affected.

2.2.1 Heritage Value Assessment

The natural heritage, human heritage, and recreational values of each river were determined through application of the scoring criteria. For the purpose of determining potential candidates for nomination to the CHRS and rivers meriting consideration as Provincial heritage resources, the study rivers were ranked by heritage and recreational values and various combinations of these.

A summary of the results of scoring and ranking for natural heritage value, human heritage value, recreational value, and selected combinations of these are presented in Tables 2-1 to 2-5. The scores achieved for individual value categories by each river are presented in Table 2-6.

2.2.2 Integrity Value Assessment

Each study river was evaluated for integrity and 12 were determined to not have the necessary natural and/or historical values. All rivers appeared to possess the required recreational values. The rivers which did not meet integrity requirements over their entire length are presented in Table 2-7 with their associated integrity ratings.

TABLE 2-1

Natural Heritage Value Scores

RANK	RIVER	SCORE
1	Lower Saint John	40.6
2	Southwest Miramichi	40.1
3	Oromocto	39.1
4	Nepisiguit	36.1
5	Kennebecasis	36.0
6	Middle Saint John	35.1
7	Northwest Miramichi	34.3
8	Restigouche	34.1
9	Kedgwick	33.5
10	Portobello	33.3
11	Tobique	33.1
12	Upsalquitch	32.6
13	Little Southwest Miramichi	32.5
14	Magaguadavic	32.1
15	Petitcodiac	31.9
16	Tetagouche	31.4
17	Patapedia	31.0
18	Eel	30.8
19	Richibucto	29.8
20	Dungarvon	28.6
20	Upper Saint John	28.6
21	Cains	28.2
22	Nashwaak	27.9
23	Kouchibouguac	26.8

TABLE 2-2

Human Heritage Value Scores

RANK	RIVER	SCORE
1	Lower Saint John	44.4
2	Northwest Miramichi	37.1
3	Southwest Miramichi	35.3
4	Little Southwest Miramichi	30.9
5	Middle Saint John	28.5
6	Nashwaak	26.6
7	Petitcodiac	26.3
8	Restigouche	24.8
9	Kennebecasis	22.5
10	Upper Saint John	20.3
11	Richibucto	18.4
12	Oromocto	18.0
13	Eel	16.5
14	Nepisiguit	15.0
15	Tobique	13.9
16	Cains	13.8
17	Tetagouche	12.8
18	Magaguadavic	11.6
19	Kouchibouguac	8.8
20	Portobello	6.6
21	Dungarvon	6.3
22	Upsalquitch	5.4
23	Kedgwick	5.0
23	Patapedia	5.0

TABLE 2-3

Recreational Value Scores

RANK	RIVER	SCORE
1	Nashwaak	41.0
2	Kennebecasis	40.8
2	Richibucto	40.8
3	Upper Saint John	40.0
4	Tobique	39.8
5	Oromocto	39.3
5	Northwest Miramichi	39.3
6	Dungarvon	39.0
6	Magaguadavic	39.0
6	Southwest Miramichi	39.0
7	Lower Saint John	38.8
8	Patapedia	38.5
9	Middle Saint John	38.0
10	Tetagouche	37.3
11	Kedgwick	36.3
12	Nepisiguit	35.5
13	Cains	34.8
13	Little Southwest Miramichi	34.8
14	Eel	33.8
15	Kouchibouguac	33.3
16	Upsalquitch	32.8
17	Portobello	30.5
18	Petitcodiac	28.5
19	Restigouche	27.3

TABLE 2-4

Natural Heritage and Human Heritage Values Scores

RANK	RIVER	COMBINED SCORE
1	Lower Saint John	85.0
2	Southwest Miramichi	75.4
3	Northwest Miramichi	71.4
4	Middle Saint John	63.6
5	Little Southwest Miramichi	63.4
6	Restigouche	58.9
7	Kennebecasis	58.5
8	Petitcodiac	58.2
9	Oromocto	57.1
10	Nashwaak	54.5
11	Nepisiguit	51.1
12	Richibucto	48.2
13	Eel	47.3
14	Tobique	47.0
14	Upper Saint John	47.0
15	Tetagouche	44.2
16	Magaguadavic	43.7
17	Cains	42.0
18	Portobello	39.9
19	Kedgwick	38.5
20	Upsalquitch	38.0
21	Patapedia	36.0
22	Kouchibouguac	35.6
23	Dungarvon	34.0

TABLE 2-5

Multiple Heritage Values Scores

RANK	RIVER	COMBINED SCORE
1	Lower Saint John	123.8
2	Southwest Miramichi	114.4
3	Northwest Miramichi	110.7
4	Middle Saint John	101.6
5	Kennebecasis	99.3
6	Little Southwest Miramichi	98.2
7	Oromocto	96.4
8	Nashwaak	95.5
9	Richibucto	89.0
10	Upper Saint John	88.9
11	Tobique	86.8
12	Petitcodiac	86.7
13	Nepisiguit	86.6
14	Restigouche	86.2
15	Magaguadavic	82.7
16	Tetagouche	81.5
17	Eel	81.1
18	Cains	76.8
19	Kedgwick	74.8
20	Patapedia	74.5
21	Dungarvon	73.9
22	Upsalquitch	70.8
23	Portobello	70.4
24	Kouchibouguac	68.9

Table 2-6 Summary of Natural Heritage Value,Human Heritage Value and Recreational Value Scores

THEME / RIVER	Cains	Dungarvon	Eel	Kedgwick	Kennebecasis	Kouchibouguac	Little Southwest Miramichi	Magaguadavic	Nashwaak	Nepisiguit	Northwest Miramichi	Oromocto	Patapedia	Petitcodiac	Portobello	Restigouche	Richibucto	Saint John - Lower	Saint John - Middle	Saint John - Upper	Southwest Miramichi	Tetagouche	Tobique	Upsalquitch
NATURAL HERITAGE																								
Geological Development	2.3	5	3.5	4.5	6.2	2.3	6	4	5.8	5.5	4.9	3.8	4.4	6	2	4	2	8.8	5.5	3	6.3	5	5.5	4.7
Physiography	3	7	7	7	3	3	7	3	7	7	7	7	7	7	3	3	3	7	7	3	10	3	7	7
Bedrock Geology	1	6	3	3	7	1	6	3	9	4	3	1	4	2	1	4	1	9	9	3	6	6	6	4
Palaeontology	2.5	2.5	0	5	7.5	2.5	5	5	2.5	5	2.5	2.5	5	10	2.5	5	2.5	10	0	0	2.5	5	2.5	5
Surficial Geology	2.8	4.5	4	2.8	7.3	2.8	5.8	5	4.5	6	7	4.5	1.5	4.8	1.5	3.8	1.5	9	5.8	6	6.5	5.8	6.3	2.8
Ongoing Processes	5.4	6.1	6.8	6.5	7.8	5.5	7	6.1	6.6	7.6	7.4	8.8	5.6	5.4	6.8	7.1	5.8	6.3	6.6	6.1	7.8	5.9	6.6	7.4
Hydrology	7	6	6	6	7	6	7	2	7	2	8	8	6	2	6	9	6	2	2	2	10	5	2	8
Water Quality	2.7	3	1	2.7	10	4.5	3.6	2.7	8	8	6.4	6.3	2.7	5.5	1	4	3.2	3.2	3.6	2.7	3	2.7	3	5
Morphology	2	5	9	7	8	1	9	10	6	10	8	9	3	6	4	6	3	7	9	9	8	9	8	10
Vegetation	6.5	8	5.5	5.5	4.5	6.5	6.5	4	6	6.5	6.5	9	6	3	9.5	6	6.5	5.5	4.5	3	7.5	4.5	7	6
Wildlife	8	7	9	9	10	9	7	8	7	9	8	10	9	9	10	10	9	10	10	10	9	6	9	7
Natural Phenomena	6	6	7	8	9	7	9	10	7	10	8	9	6	8	8	8	6	10	9	8	10	8	8	8
Natural Beauty	8	8.5	6.5	9	5	8	8	6.5	6	8	8	8.5	9.5	4.5	9	8	7.5	5.5	5	5	8.5	8.5	7.5	8.5
Features	9	8	9	9	9	9	9	10	8	10	9	9	9	8	9	9	8	10	9	9	10	9	9	9
Alteration	7	9	4	9	1	7	7	3	4	6	7	8	10	1	9	7	7	1	1	1	7	8	6	8
Biota	6.5	3	7	5.5	8	4	2.5	5.5	2.5	5	6	9	5.5	8	7.5	7	8.5	10	9	6.5	7.5	4	5.5	4
Rare/Endangered	9	4	9	9	6	1	1	9	1	6	6	9	9	9	9	6	9	10	10	9	9	5	9	6
Species Concentrations	4	2	5	2	10	7	4	2	4	4	6	9	2	7	6	8	8	10	8	4	6	3	2	2
TOTAL NATURAL HERITAGE	28.2	28.6	30.8	33.5	36	26.8	32.5	32.1	27.9	36.1	34.3	39.1	31	31.9	33.3	34.1	29.8	40.6	35.1	28.6	40.1	31.4	33.1	32.6
HUMAN HERITAGE																								
Historical Development	3	1	3.7	1	5	2	4.7	3.3	6.7	3.3	8	5	1	6.3	1.3	6	6.3	10	6.3	6	9.3	2.7	3.3	1.3
Native People	5	1	6	1	4	4	9	5	6	5	10	6	1	6	2	6	8	10	10	9	9	1	6	2
Settlement Patterns	2	1	2	1	6	1	3	3	10	4	9	6	1	7	1	6	6	10	6	6	10	6	3	1
Transportation	2	1	3	1	5	1	2	2	4	1	5	3	1	6	1	6	5	10	3	3	9	1	1	1
Persons/Concepts	2	1	4	1	4	1	3	1	5	3	5	3	1	8	1	4	3	10	6	5	9	5	2	1
Rare Finds	4	2	5	1	6	3	10	3	7	3	10	5	1	6	2	7	6	10	8	5	8	1	6	1
Themes in Canadian History	2	1	2	1	5	1	7	2	5	4	10	3	1	6	1	5	1	10	5	2	5	4	1	1
TOTAL HUMAN HERITAGE	13.8	6.3	16.5	5	22.5	8.8	30.9	11.6	26.6	15	37.1	18	5	26.3	6.6	24.8	18.4	44.4	28.5	20.3	35.3	12.8	13.9	5.4
RECREATIONAL VALUE																								
Capabilities	6.9	6.6	6.5	7.5	7.3	5.8	6.9	6.6	7.4	7.2	6.7	6.7	6.4	4.9	6.2	6.4	7.3	7.5	7.2	7	7.6	5.9	6.9	6.1
Range of Appropriate Activities	34.5	30	34.5	37.5	37.5	23.5	35.5	34.5	40.5	39.5	30.5	36.5	31.5	22.5	22.5	32.5	35.5	41.5	38.5	37.5	46.5	29.5	40.5	27.5
Natural Values	15	15	16	16	14	16	17	16	14	13	13	14	19	11	15	14	17	11	11	12	15	13	12	16
Physical Factors	37	37	31	41	40	33	34	32	38	38	40	33	29	28	40	33	39	41	40	38	33	31	34	33
Impacts/Sensitivities	7	9	7	7	9	7.5	7	9	9	7	9	9	9	6.5	6	4.5	9	8	8	9	8	9	9	7
Physical/Ecological Impacts	9	9	7	9	9	6	9	9	9	9	9	9	9	8	7	6	9	9	9	9	9	9	9	9
Social/Psychological Impacts	5	9	7	5	9	9	5	9	9	5	9	9	9	5	5	3	9	7	7	9	7	9	9	5
TOTAL RECREATIONAL VALUE	34.8	39	33.8	36.3	40.8	33.3	34.8	39	41	35.5	39.3	39.3	38.5	28.5	30.5	27.3	40.8	38.8	38	40	39	37.3	39.8	32.8
COMBINED TOTAL SCORE	76.8	73.9	81.1	74.8	99.3	68.9	98.2	82.7	95.5	86.6	110.7	96.4	74.5	86.7	70.4	86.2	89	123.8	101.6	88.9	114.4	81.5	86.8	70.8

TABLE 2-7
Integrity Ratings

RIVER	INTEGRITY VALUE	RATING FACTOR
Petitcodiac	Natural	0.72
	Historical	0.65
Tobique	Natural	0.89
	Historical	0.86
Restigouche	Natural	0.88
	Historical	0.88
Kennebecasis	Natural	0.63
	Historical	0.92
Magaguadavic	Natural	0.9
	Historical	0.9
Nepisiguit	Natural	0.9
	Historical	0.92
Northwest Miramichi	Natural	0.94
Oromocto	Natural	0.9
Saint John - Lower	Natural	0.65
	Historical	0.93
Saint John - Middle	Natural	0.22
	Historical	0.32
Saint John - Upper	Natural	0.5
	Historical	0.62
Southwest Miramichi	Natural	0.86
	Historical	0.92

2.2.3 River Values Adjusted for Integrity

The integrity ratings are applied to heritage value scores to determine the impact on ranking of rivers for heritage values. Adjusted scores and rankings are presented in Tables 2-8 to 2-11.

TABLE 2-8

Adjusted Natural Heritage Value Scores

RANK	RIVER	HERITAGE SCORE	INTEGRITY RATING	ADJUSTED SCORE
1	Oromocto	39.1	0.90	35.2
2	Southwest Miramichi	40.1	0.86	34.5
3	Kedgwick	33.5	1.00	33.5
4	Portobello	33.3	1.00	33.3
5	Upsalquitch	32.6	1.00	32.6
6	Nepisiguit	36.1	0.90	32.5
6	Little Southwest Miramichi	32.5	1.00	32.5
7	Northwest Miramichi	34.3	0.94	32.2
8	Tetagouche	31.4	1.00	31.4
9	Patapedia	31.0	1.00	31.0
10	Eel	30.8	1.00	30.8
11	Restigouche	34.1	0.88	30.0
12	Richibucto	29.8	1.00	29.8
13	Tobique	33.1	0.89	29.5
14	Magaguadavic	32.1	0.90	28.9
15	Dungarvon	28.6	1.00	28.6
16	Cains	28.2	1.00	28.2
17	Nashwaak	27.9	1.00	27.9
18	Kouchibouguac	26.8	1.00	26.8
19	Lower Saint John	40.6	0.65	26.4
20	Petitcodiac	31.9	0.72	23.0
21	Kennebecasis	36.0	0.63	22.7
22	Upper Saint John	28.6	0.50	14.3
23	Middle Saint John	35.1	0.22	7.7

TABLE 2-9

Adjusted Human Heritage Value Scores

RANK	RIVER	HERITAGE SCORE	INTEGRITY RATING	ADJUSTED SCORE
1	Lower Saint John	44.4	0.93	41.3
2	Northwest Miramichi	37.1	1.00	37.1
3	Southwest Miramichi	35.3	0.92	32.5
4	Little Southwest Miramichi	30.9	1.00	30.9
5	Nashwaak	26.6	1.00	26.6
6	Restigouche	24.8	0.88	21.8
7	Kennebecasis	22.5	0.92	20.7
8	Richibucto	18.4	1.00	18.4
9	Oromocto	18.0	1.00	18.0
10	Petitcodiac	26.3	0.65	17.1
11	Eel	16.5	1.00	16.5
12	Nepisiguit	15.0	0.92	13.8
12	Cains	13.8	1.00	13.8
13	Tetagouche	12.8	1.00	12.8
14	Upper Saint John	20.3	0.62	12.6
15	Tobique	13.9	0.86	12.0
16	Magaguadavic	11.6	0.90	10.4
17	Middle Saint John	28.5	0.32	9.1
18	Kouchibouguac	8.8	1.00	8.8
19	Portobello	6.6	1.00	6.6
20	Dungarvon	6.3	1.00	6.3
21	Upsalquitch	5.4	1.00	5.4
22	Kedgwick	5.0	1.00	5.0
22	Patapedia	5.0	1.00	5.0

TABLE 2-10

Adjusted Natural Heritage and Human Heritage Values Scores

RANK	RIVER	COMBINED ADJUSTED SCORE
1	Northwest Miramichi	69.3
2	Lower Saint John	67.7
3	Southwest Miramichi	67.0
4	Little Southwest Miramichi	63.4
5	Nashwaak	54.5
6	Oromocto	53.2
7	Restigouche	51.8
8	Richibucto	48.2
9	Eel	47.3
10	Nepisiguit	46.3
11	Tetagouche	44.2
12	Kennebecasis	43.4
13	Cains	42.0
14	Tobique	41.5
15	Petitcodiac	40.1
16	Portobello	39.9
17	Magaguadavic	39.3
18	Kedgwick	38.5
19	Upsalquitch	38.0
20	Patapedia	36.0
21	Kouchibouquac	35.6
22	Dungarvon	34.9
23	Upper Saint John	26.9
24	Middle Saint John	16.8

TABLE 2-11

Adjusted Multiple Heritage Values Scores

RANK	RIVER	COMBINED ADJUSTED SCORE
1	Northwest Miramichi	108.6
2	Lower Saint John	106.5
3	Southwest Miramichi	106.0
4	Little Southwest Miramichi	98.2
5	Nashwaak	95.5
6	Oromocto	92.5
7	Richibucto	89.0
8	Kennebecasis	84.2
9	Nepisiguit	81.8
10	Tetagouche	81.5
11	Tobique	81.3
12	Eel	81.1
13	Restigouche	79.1
14	Magaguadavic	78.3
15	Cains	76.8
16	Kedgwick	74.8
17	Patapedia	74.5
18	Dungarvon	73.9
19	Upsalquitch	70.8
20	Portobello	70.4
21	Kouchibouquac	68.9
22	Petitcodiac	68.6
23	Upper Saint John	66.9
24	Middle Saint John	54.8

2.3 River Management Considerations

2.3.1 Regulatory Tools For Heritage River Management

No one department or agency, either federal or provincial has the sole mandate to manage rivers and their associated resources, nor is there legislation which relates to management of all types of rivers and their associated resources. There are several agencies, or departments which manage resources directly associated with rivers, while other agencies, in fulfilling their mandate, may indirectly affect the management of rivers and their resources. Pertinent federal and provincial legislation is reviewed in Section 5.0 of Volume I.

2.3.2 Management Options In New Brunswick

At the present time, there is no overall act or department in New Brunswick responsible for comprehensive management of water resources. Several acts exist, however, which deal with water, land and resource management issues which could be used as management tools supportive of the CHRS objectives. Up to this point all of the rivers in Canada designated as heritage rivers have been within national or provincial parks, which is ideal from a management point of view. In New Brunswick, as in the other Atlantic Provinces, most of the potential heritage rivers flow through freehold land. It is estimated that crown land represents 44 percent of the total provincial land area in New Brunswick (Report of the Land Use Policy Task Force). If the designated sections of a heritage river were on crown land, the general consensus is that management would be relatively easy.

All crown land falls under the control of one agency, the Department of Natural Resources and Energy and, through the Crown Lands and Forest Act, the Minister can exercise extensive management and control in keeping with the CHRS objectives.

Management of heritage rivers outside crown lands would be much more complex. Management is compounded by the many political or administrative jurisdictions (federal, provincial, municipal, regional and private) that exist as well as the multitude of demands that are placed on the river system for water supply, hydroelectric power, sewage disposal, commercial use, fisheries and recreation. At the present time, with no overall act, agency or coordinating structure for heritage rivers or water resource management, management for protection and conservation of heritage rivers would depend on the enforcement of the various existing acts by the separate government departments charged with responsibility for implementation and enforcement of those acts.

In terms of land use control along rivers, the most significant acts would be the Community Planning Act and the Clean Environment Act or the Clean Water Act, which would be the most important with respect to the water resource itself.

Although the Community Planning Act is the most comprehensive legislation tool available to manage development along heritage rivers, the major weakness is its inability to address land use management in unincorporated areas which are much more extensively affected than municipalities. The weakness lies in a lack of elected representation or bureaucratic structure to implement land use policies or controls.

Water use itself in New Brunswick is directly controlled, managed or influenced by a variety of departments and agencies which largely work independently. There are recent and ongoing changes under the Clean Water Act that could result in greater coordination of land use and water use issues.

2.3.2.1 Inter-Departmental Management Structure

Because the option of having the various government departments independently responsible for management of heritage rivers would add to what is already a complex management situation, it would seem that a better option would be to set up some kind of inter-agency or inter-departmental management structure involving all government departments with acts or regulations affecting the designated river.

New Brunswick already has a good example of how this inter-departmental structure might be achieved. This refers specifically to the formation of a Land and Water Advisory Committee under the Clean Water Act and the introduction of the Watershed Designation Program.

The new Clean Water Act is a major positive step in dealing with water management issues. All water aspects formerly under the Clean Environment Act have been transferred to the Clean Water Act. The Act is designed primarily to address the issue of water quality, particularly with reference to public water supply systems. Although the Act cannot be used directly to reserve or manage rivers for heritage purposes, there are certainly benefits that would accrue to the natural, human and recreational heritage of rivers through the application of the Act to water quality matters.

The Land and Water Advisory Committee is comprised of members who are employed by the Province and who represent departments, commissions, offices or other bodies that have direct interest in land and water use. At the present time, the Committee has representatives from the Departments of Tourism, Recreation and Heritage; Natural Resources and Energy; Municipal Affairs; Environment; Transportation; Commerce and Technology; NB Power; Health and Community Services; Agriculture; Supply and Services; Policy Secretariat and the Economic Development Commissioner's office.

Although this committee, as defined under the Act, would not serve as a management agency, it could be an initial review agency. With so many key departments represented it could provide a comprehensive overview to ensure government activities, which affect the management of heritage rivers, are coordinated with the various acts and regulations. The members not only appreciate the need to enforce the acts but they could also provide technical advice from their various areas of expertise. Review by this committee would also go a long way to establishing credibility for the heritage river program.

At the present time the Terms of Reference are being finalized for a sub-committee of the Advisory Committee called the Inter-departmental Land and Water Use Committee. This committee will be composed of senior policy people who will be charged with the preparation of a working paper on land and water use policy. The focus of the committee will be on practical and implementable policies. It is possible that the heritage river program could merit consideration by that group.

It is not inconceivable that one of these committees could be a forerunner leading to the establishment of a similar committee that might deal strictly with heritage rivers.

2.3.2.2 River Classification and Performance Standards

Under the Clean Water Act there may be other regulations that will be introduced that could assist in the management of heritage rivers. For instance, consideration is being given to the development of a classification system for rivers based upon the need to protect its water quality. Rivers, for which high water quality standards are critical, would have more severe limitations on development and use than those that were not as critical. Again, heritage rivers might be considered in developing such a classification system. One of the problems at present (for heritage river considerations) is that water quality guidelines and monitoring are based on drinking water standards. Other than some general guidelines by Health and Welfare Canada in the Canadian Drinking Water Standards, there are few standards related to water quality for recreational use (swimming, boating, fishing).

It is recommended that consideration be given to base management of heritage rivers on performance criteria standards as opposed to straight land use controls. The acceptability of various land uses or activities could be based on acceptable water quality guidelines for recreational use. This approach would require ongoing monitoring of water quality. Such an approach would fit in well with a classification system such as that mentioned above.

2.3.2.3 Heritage River Designation

The final option suggested for consideration is the adoption of a program for heritage rivers that is similar to the Watershed Designation Program as developed under the new Clean Water Act. This would require consideration of separate legislation providing a designated heritage river with protection to ensure development consistent with the objectives and guidelines as established for the CHRS program.

Watershed designation is based on a policy of water quality maintenance through land use and development controls in municipal water supply watersheds. Because watershed designation also provides the Minister of the Environment with the power to control, prohibit, restrict or limit activities, it represents a much more powerful tool than land use controls such as zoning which can only control land uses, and not necessarily activities, within the watershed.

A similar designation process might be considered for heritage rivers. The Province's experience with inter-departmental committees described in Section 2.3.2.1 and with the watershed designation program illustrates that the Province does have the capability to set up structures and programs to manage the water resource. The watershed designation program covers over 30 watersheds in New Brunswick.

Regardless of the approach eventually taken, all options involve control over land uses and activities on private property. Because of the unpopularity of land use controls in rural areas, it is essential that a public consultation process (possibly similar to that used for the watershed designation process) be incorporated in order to reach agreement or compromise on heritage river management requirements and private landowners' interests.

A full management plan would have to be prepared before any of the rivers being considered are designated under the CHRS program. By the time this management plan is required, many of the programs and committees described in the above options will have been in operation and their effectiveness will have been evaluated.

2.3.3 Management Feasibility Assessment of the Study Rivers

Rivers are complicated entities to manage since there are so many potential ownership and jurisdictional patterns, along with a multitude of demands on the resource for urban and rural uses, active and passive recreation, infrastructural requirements as well as conservation and protection. It is not surprising, then, that resource conflicts arise among the various potential users, each viewing the resource from their different perspectives and value systems.

The management issues and concerns for the New Brunswick study rivers were considered under 10 major headings which form the basis from which criteria were developed to assess the management feasibility for each. The management considerations and their respective rating criteria are listed in Table 2-12.

The rating of management feasibility was based on existing land use and water use as well as known potential uses. The selected management issues and concerns were evaluated for each river to determine the management feasibility score. Summarized management feasibility scores for study rivers are presented in Table 2-13. The scores achieved for individual management considerations by each river are presented in Table 2-14.

TABLE 2-12

Management Considerations and Rating Criteria

Management Consideration	Rating Criteria
Land and Resource Ownership Patterns	Score of 1 to 10 based on percentage of length of river environment in Crown ownership.
Jurisdictional Patterns	Score of 1 to 10 based on number of jurisdictions within river environment.
Urbanization	Score of 1 to 10 based on percentage of length of river environment developed for urban-type uses.
Linear Development	Score of 1 to 10 based on percentage of length of river environment affected by linear development.
Recreation and Conservation Use	Score 1 to 20 based on percentage of length of river environment within designated areas.
Agricultural Activities	Score of 1 to 5 based on number of areas within river environment with concentrated agricultural activity.
Forestry Operations	Score of 1 to 10 based on percentage of length of river environment affected by recent forestry operations.
Fisheries	Score of 1 to 10 based on number of commercial or Native fisheries, hatcheries, aquaculture operations on the river.
Hydroelectric Power Development and Dams	Score of 0 to minus 20 based on percentage of length of river environment affected by impoundments.
Mineral and Aggregate Resources	Score of 1 to 10 based on number of mines, mills, quarries within river environment.

TABLE 2-13

Summary of River Management Feasibility Scores

RANK	RIVER	SCORE
1	Patapedia	84.2
2	Kedgwick	80.6
3	Cains	68.4
4	Dungarvon	64.1
5	Upsalquitch	63.3
6	Portobello	63.1
7	Kouchibouguac	59.2
8	Eel	57.5
9	Little Southwest Miramichi	56.3
9	Restigouche	56.3
10	Nepisiguit	54.7
11	Oromocto	52.1
12	Tetagouche	49.2
13	Northwest Miramichi	46.1
14	Richibucto	42.8
15	Nashwaak	41.5
16	Magaguadavic	39.9
17	Tobique	37.2
18	Southwest Miramichi	30.9
19	Lower Saint John	24.7
20	Petitcodiac	20.8
21	Kennebecasis	17.9
22	Upper Saint John	16.2
23	Middle Saint John	7.2

TABLE 2-14 Summary of Management Consideration Scores

MANAGEMENT CONSIDERATION / RIVER	Cains	Dungarvon	Eel	Kedgwick	Kennebecasis	Kouchibouguac	Little Southwest Miramichi	Magaguadavic	Nashwaak	Nepisiguit	Northwest Miramichi	Oromocto	Patapedia	Petitcodiac	Portobello	Restigouche	Richibucto	Saint John - Lower	Saint John - Middle	Saint John - Upper	Southwest Miramichi	Tetagouche	Tobique	Upsalquitch
Ownership Pattern	8.7	9.0	2.9	10.0	0.6	7.0	8.0	3.2	4.8	8.2	5.5	4.0	10.0	0.3	0.1	4.0	3.7	1.5	1.0	0.0	0.5	6.9	2.1	8.6
Jurisdictional Pattern	9.0	9.0	9.0	10.0	0.0	8.0	8.0	8.0	6.0	8.0	8.0	7.0	10.0	2.0	8.0	5.0	6.0	3.0	0.0	0.0	1.0	8.0	7.0	9.0
Urbanization	9.7	9.5	9.6	9.8	2.1	8.8	8.9	8.1	6.5	9.0	7.8	8.0	9.9	1.0	9.3	9.3	6.0	0.3	1.5	0.0	5.6	7.2	5.7	8.6
Linear Development	6.9	4.9	6.5	7.0	1.3	4.4	5.0	3.4	2.1	5.2	5.6	4.8	9.5	0.4	6.0	6.4	3.7	0.0	0.0	0.0	5.0	3.4	1.9	4.7
Recreation/Conservation Use	3.0	2.2	0.0	10.0	0.03	4.0	1.44	0.0	0.42	1.5	0.26	2.74	9.8	0.28	10.6	0.91	0.42	6.0	0.6	0.0	0.23	0.0	1.3	0.0
Agricultural Activities	5.0	5.0	5.0	5.0	1.5	4.0	4.5	4.0	4.0	4.5	4.5	5.0	5.0	0.0	4.0	4.0	4.0	0.5	0.0	0.0	3.0	3.5	3.5	5.0
Forestry Operations	7.1	8.5	5.5	8.8	8.4	8.0	8.5	3.2	7.7	9.1	8.4	9.6	10.0	9.4	7.1	8.7	9.0	9.4	8.7	9.2	8.6	9.2	8.9	9.4
Fisheries	10.0	10.0	10.0	10.0	4.0	7.0	9.0	8.0	10.0	10.0	6.0	7.0	10.0	5.0	9.0	9.0	7.0	4.0	9.0	10.0	7.0	10.0	9.0	10.0
Hydro and Dams	8.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	0.0	-0.8	0.0	0.0	0.0	-5.6	0.0	0.0	0.0	0.0	-13.6	-7.0	-0.08	0.0	-2.2	0.0
Mineral and Aggregate Resources	9.0	6.0	9.0	10.0	0.0	8.0	3.0	4.0	0.0	0.0	0.0	4.0	10.0	8.0	9.0	9.0	3.0	0.0	0.0	4.0	0.0	1.0	0.0	8.0
MANAGEMENT FEASIBILITY SCORE	68.4	64.1	57.5	80.6	17.9	59.2	56.3	39.9	41.5	54.7	46.1	52.1	84.2	20.8	63.1	56.3	42.8	24.7	7.2	16.2	30.9	49.2	37.2	63.3

3.0 CONCLUSIONS

3.1 River Values

The results of this study show that New Brunswick has many rivers with outstanding resource value with respect to natural heritage, human heritage, and recreation.

3.1.1 Natural Heritage Value

Study rivers scored more than half of the maximum score possible indicating relatively high natural heritage value. Ranked by their natural heritage value score, these range from 40.6 to 26.8. There is no dramatic point spread within the range for delineating a threshold to define the best rivers for natural heritage value. However, there is a three-point gap between the rivers ranking third and fourth indicating slight distinction for the top three rivers.

The ten highest ranking rivers for natural heritage value include the Lower Saint John, Southwest Miramichi, Oromocto, Nepisiguit, Kennebecasis, Middle Saint John, Northwest Miramichi, Restigouche, Kedgwick, and Portobello rivers.

3.1.2 Human Heritage Value

The ranking of rivers by their human heritage value score resulted in scores ranging from 44.4 to 5. The upper three rivers have scores which are more widely separated from the other rivers than those below these.

Rivers ranking in the upper ten for their human heritage value include the Lower Saint John, Northwest Miramichi, Southwest Miramichi, Little Southwest Miramichi, Middle Saint John, Nashwaak, Petitcodiac, Restigouche, Kennebecasis, and Upper Saint John rivers.

3.1.3 Recreational Value

The study rivers scored more than half of the potential score, indicating that even those ranked lowest have considerable recreation potential. The scores ranged from 41.0 to 27.3, decreasing very gradually. There are no dramatic breaks in the scores for determining a grouping of best rivers.

Due to the close scoring, ten rivers ranked in the top six, having a range of 2 points. These rivers include the Nashwaak, Kennebecasis, Richibucto, Upper Saint John, Tobique, Oromocto, Northwest Miramichi, Dungarvon, Magaguadavic, and Southwest Miramichi.

3.1.4 Integrity Values

All rivers met the integrity guidelines for recreation. Twelve of the study rivers met the requirements of the natural and historical integrity guidelines. These include the Cains, Dungarvon, Eel, Kedgwick, Kouchibouguac, Little Southwest Miramichi, Nashwaak, Patapedia, Portobello, Richibucto, Tetagouche, and Upsalquitch rivers. The remaining twelve had partially impaired integrity. Of these, ten rivers had integrity ratings of 0.7 or greater, indicating that relatively large sections of the river, with suitable heritage value scores, could be considered for CHRS nomination. These include the Petitcodiac (natural), Tobique, Restigouche, Kennebecasis (human), Magaguadavic, Nepisiguit, Northwest Miramichi, Oromocto, Lower Saint John (human), and Southwest Miramichi rivers.

3.2 River Management

3.2.1 Management Options

3.2.1.1 Application of Acts by the Various Government Departments

Presently, there is no overall act or department in New Brunswick responsible for comprehensive management of water resources. Several acts do exist which deal with water, land and resource management issues which could be used as management tools, supportive of the CHRS objectives. If the designated sections of a heritage river in New Brunswick were on Crown Land, management would be relatively easy. All Crown Land falls under the control of the Department of Natural Resources and Energy, and through the Crown Lands and Forest Act, the Minister can exercise extensive management and control in keeping with the CHRS objectives.

Management of heritage rivers outside of Crown Lands would depend on the enforcement of the various existing acts by the separate government departments charged with responsibility for implementation and enforcement of those acts.

In terms of land use control along rivers, the most significant acts would be the Community Planning Act and the Clean Environment Act (or the Clean Water Act). Under the Community Planning Act, there is sufficient legislation to aid in management of the resource, however, in rural areas there is a lack of elected representation and a bureaucratic structure to effectively implement the legislation.

Greater strides are being taken under the Clean Water Act and its regulations. The legislation is heading in a direction that would benefit and fulfil some of the CHRS objectives for heritage rivers.

3.2.1.2 Inter-Departmental Management Structure

The option of having the various government departments independently responsible for management of heritage rivers would add to an already complex management situation. A better option would be to set up an inter-agency or inter-departmental management structure involving all government departments with acts or regulations affecting the designated river.

New Brunswick already has a good example of how this inter-departmental structure might be achieved, with formation of a Land and Water Advisory Committee under the Clean Water Act and the introduction of the Watershed Designation Program.

The Land and Water Advisory Committee is comprised of members who are employed by the Province and who represent departments, commissions, offices or other bodies that have direct interest in land and water use. Although this committee, as defined under the Act, would not serve as a management agency, it could be an initial review agency. Having many key departments represented, it could provide a comprehensive overview to ensure government activities which affect the management of heritage rivers are coordinated with the various acts and regulations. The members not only appreciate the need to enforce the acts, but they could also provide technical advice from their various areas of expertise.

A sub-committee of the Advisory Committee called the Inter-Departmental Land and Water Use Committee, composed of senior policy people, will be charged with the preparation of a working paper on land and water use policy. The focus of the committee will be on practical and implementable policies and the heritage river program could merit consideration by that group.

One of these committees could be a forerunner leading to the establishment of a similar committee to deal strictly with heritage rivers.

3.2.1.3 River Classification and Performance Standards

Under the Clean Water Act there may be other regulations that will be introduced that could assist in the management of heritage rivers. Consideration is being given to the development of a classification system for rivers based upon the need to protect their water quality. Again, heritage rivers could be considered in developing such a classification system.

An alternative approach is to base management of heritage rivers on performance criteria standards as opposed to straight land use controls. This approach would require ongoing monitoring of water quality and would fit in well with a classification system such as that mentioned above.

3.2.1.4 Heritage River Designation

The final option suggested for consideration is the adoption of a program for heritage rivers that is similar to the Watershed Designation Program as developed under the new Clean Water Act. This would require consideration of separate legislation to provide a designated heritage river with protection that would ensure that development would be in keeping with the objectives and guidelines as established for the CHRS program.

Recent experience with inter-departmental committees and the Watershed Designation Program illustrates that the Province has the capability of managing the water resource. A similar designation program for heritage rivers may not be warranted or justified, given the small number of heritage rivers that are likely to be designated compared to the 30 watersheds under the Watershed Designation Program.

3.2.1.5 Public Consultation

Regardless of the approach eventually taken, all options involve control over land uses and activities on private property. Land use controls in rural areas are unpopular and it is essential that a public consultation process be incorporated in order to reach agreement or compromise on heritage river management requirements and private landowner's interests.

3.2.1.6 Selection of Management Options

It is recognized that before any of the rivers under consideration are designated under the CHRS program, a full management plan would have to be prepared. When this is likely to be required, many of the programs and committees described in the above options will have had time to operate and be evaluated.

It is obvious that allowing each of the agencies or departments involved, to independently apply their various legislative tools would not constitute a satisfactory management approach. To be effective there should be an overall coordinating agency or inter-departmental committee composed of the various federal, provincial and possibly municipal representatives that have legislation affecting heritage rivers. That committee could be responsible for the formulation and implementation of management plans for heritage rivers. It would set out the policies and practices to be followed by the managing agencies to ensure that the development, management and use of the river is consistent with the objectives and guidelines of the CHRS program.

It is premature to conclude if the heritage river designation option with separate legislation would be achievable. This will be much easier to decide after some experience is gained with the Watershed Designation Program or after other Provinces in the country have had some experience in the management of heritage rivers outside of the Crown Land context.

3.2.1.7 Management Feasibility

In the context of management of rivers in New Brunswick, the management issues and concerns with the greatest potential to impact on the ease of management were evaluated and used to rank study rivers. The rivers which were highly ranked are those which are largely in remote areas with minimal development and human habitation or have relatively large areas devoted to conservation uses. Rivers which scored highly for heritage values did not necessarily score highly for management feasibility.

The management feasibility assessment of the study rivers provides a working tool for the nominating and managing government with which to determine and resolve potential management problems.

3.3 Potential Heritage Rivers

Based on the analysis of natural heritage value, human heritage value, recreational value, and integrity value, eight rivers were determined as potential heritage rivers. These include the Lower Saint John, Southwest Miramichi, Nashwaak, Northwest

Miramichi, Kennebecasis, Richibucto, Oromocto, and Upper Saint John rivers. The rivers are listed in Table 3-1 with respective heritage value guideline rankings and integrity ratings.

Management feasibility is an important factor for the nominating and managing government to consider in choosing the most desirable candidate. The salient concerns affecting the ease of management of each river are presented in Table 3-2.

Table 3-1 Potential Heritage Rivers

River	Heritage Value Guideline	Ranking	Integrity Rating
Lower Saint John	Natural	1	0.65*
	Human	1	0.93
	Recreation	7	1.0
Southwest Miramichi	Natural	2	0.86
	Human	3	0.92
	Recreation	6	1.0
Nashwaak	Natural	22	1.0
	Human	6	1.0
	Recreation	1	1.0
Northwest Miramichi	Natural	7	0.94
	Human	2	1.0
	Recreation	5	1.0
Kennebecasis	Natural	5	0.63*
	Human	9	0.92
	Recreation	2	1.0
Richibucto	Natural	19	1.0
	Human	11	1.0
	Recreation	2	1.0
Oromocto	Natural	3	0.9
	Human	12	1.0
	Recreation	6	1.0
Upper Saint John	Natural	20	0.5*
	Human	10	0.62*
	Recreation	3	1.0

* Does not meet minimum integrity rating requirement of 0.8.

Table 3-2 Management Considerations for Potential Heritage Rivers

River	Management Feasibility Ranking	Management Considerations
Lower Saint John	19	85 percent privately owned; 7 government jurisdictions; 97 percent contains urban uses; entire length has linear developments; 22 historic sites, 1 provincial park, 2 Indian reserves, CFB Gagetown; agricultural activity concentrated in 9 areas; 6 percent with recent forestry operations; 5 commercial fisheries and a fish hatchery; 33 quarry operations.
Southwest Miramichi	18	95 percent privately owned; 9 government jurisdictions; 44 percent contains urban uses; 50 percent has linear developments; 2 provincial parks, 6 historic sites, 1 Indian reserve, 1 military reserve; agricultural activities concentrated in 7 areas; 14 percent with recent forestry operations; 3 commercial fisheries; small lumber mill impoundment.
Nashwaak	15	52 percent privately owned; 4 government jurisdictions; 35 percent contains urban uses; 79 percent has linear developments; 1 historic site, 1 Indian reserve; agricultural activity concentrated in 2 areas; 23 percent with recent forestry operations; 17 quarry operations.
Northwest Miramichi	13	55 percent Crown Land; 2 government jurisdictions; 22 percent contains urban uses; 44 percent has linear developments; 1 provincial park, 2 historic sites, 2 Indian reserves; agricultural activity concentrated in 1 area; 16 percent with recent forestry operations; 3 commercial fisheries, 1 Native food fishery; 10 quarry operations.

Table 3-2 Management Considerations for Potential Heritage Rivers (cont.)

River	Management Feasibility Ranking	Management Considerations
Kennebecasis	21	94 percent privately owned; 11 government jurisdictions; 79 percent contains urban uses; 87 percent has linear developments; 3 historic sites; agricultural activities concentrated in 7 areas; 16 percent with recent forestry operations; 5 commercial fisheries, 1 aquaculture operation; 12 quarry operations and 1 mine.
Richibucto	14	63 percent privately owned; 4 government jurisdictions; 40 percent contains urban uses; 63 percent has linear developments; 1 national park, 1 historic site; agricultural activity concentrated in 2 areas; 10 percent with recent forestry operations; 3 commercial fisheries; 6 quarry operations, peat harvesting.
Oromocto	11	60 percent privately owned; 3 government jurisdictions; 20 percent contains urban uses; 52 percent has linear developments; 1 provincial park, 1 military reserve; 4 percent with recent forestry operations; 3 commercial fisheries; 6 quarry operations.
Upper Saint John	22	Entirely privately owned; 12 government jurisdictions; entire length has urban uses; entire length has linear developments; agricultural activity concentrated in 11 areas, 4 percent with recent forestry operations; hydroelectric development at Grand Falls; 6 quarry operations.

4.0 RECOMMENDATIONS

1. Although the heritage resource assessment was based on the best available data, certain data bases were somewhat dated, and the study did not have the benefit of a field reconnaissance program. Therefore, it is recommended that: a) data bases for water quality be updated through the establishment of a water quality monitoring program on rivers considered as highly probable candidates for nomination to the CHRS or as provincial heritage resources; and (b) a field reconnaissance program be implemented on these rivers to address information deficiencies identified in the heritage resource assessment and to compliment the information utilized in the assessment.

2. Based on the assessment of heritage value, recreational value and integrity value, it is recommended that the following rivers be given further consideration as potential CHRS candidates or provincial heritage resources:

Lower Saint John River	Ranked 1st Natural Heritage*, 1st Human Heritage.
Southwest Miramichi River	Ranked 2nd Natural Heritage, 3rd Human Heritage.
Nashwaak River	Ranked 1st Recreation.
Northwest Miramichi River	Ranked 2nd Human Heritage.
Kennebecasis River	Ranked 2nd Recreation.
Richibucto River	Ranked 2nd Recreation.

Oromocto River	Ranked 3rd Natural Heritage.
Upper Saint John River	Ranked 3rd Recreation.

* Does not meet minimum integrity requirement.

3. The management options presented in this document should be reviewed by the Province, with input from the various agencies or departments involved in each, to determine an acceptable and realistic approach to heritage river management in the Province.

4. The Province should consider setting up (or use an existing) an inter-departmental committee responsible for the formulation and implementation of management plans for heritage rivers.

5. Provincial departments that would be involved in management of heritage rivers are currently involved in the launching of a Watershed Designation Program, and it is recommended that the experience gained through that process be applied to consideration of developing and adopting similar separate legislation for heritage rivers.

6. Regardless of the options eventually chosen, it should be accompanied by a process of public consultation to ensure public support for the designation and management of heritage rivers.